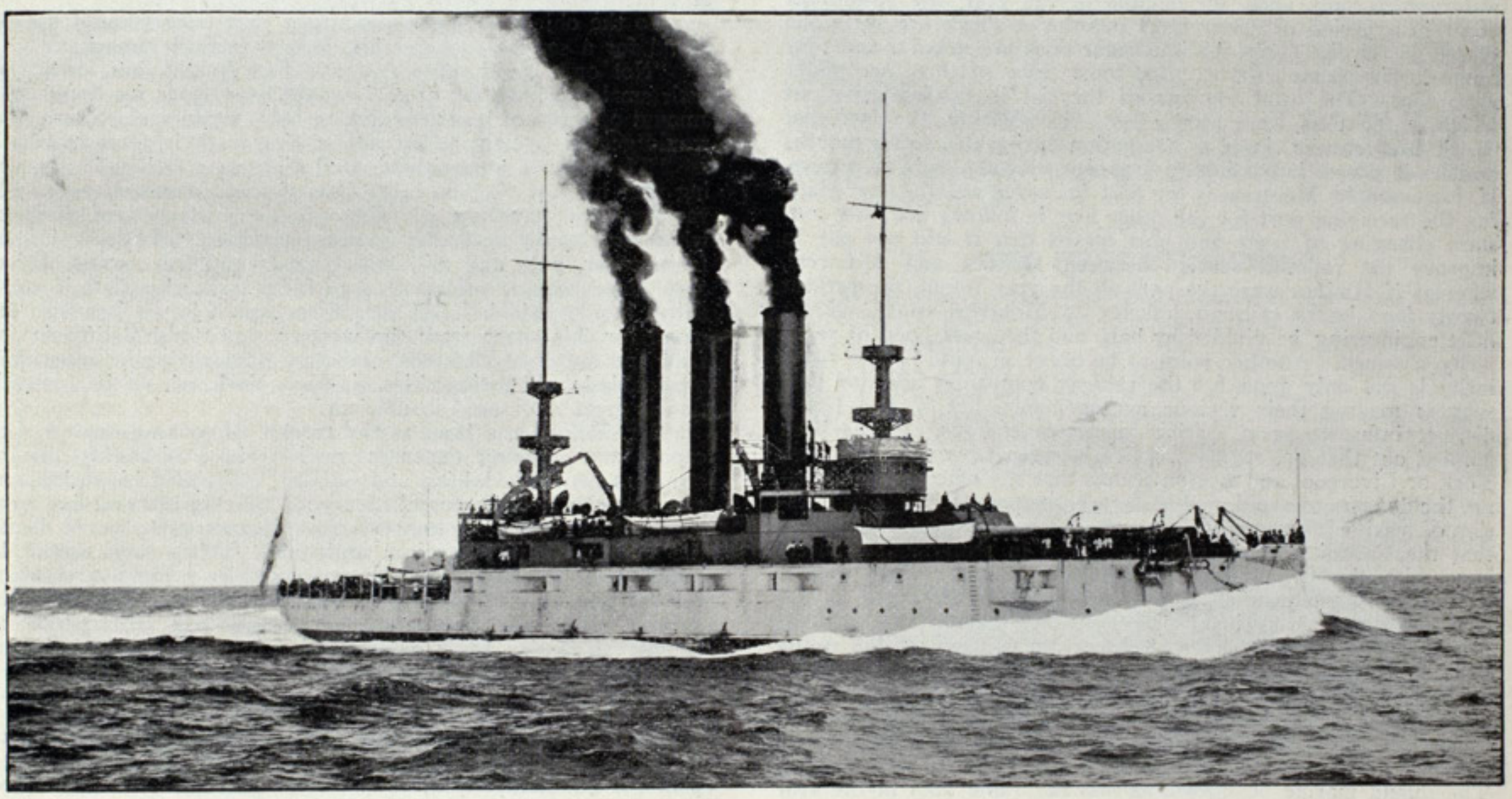
MARINE REVIEW
AND MARINE RECORD.

Vol XXVI. | Published every Thursday at 29-41 Wade Bldg by the Marine Review Pub. Co. | CLEVELAND, O., SEPT. 11, 1902. CHICAGO OFFICE, 373 DEARBORN ST | Subscription $3.00 year. Foreign $4.50 year. SingleCopy 10 cents | No. 11

THE NEW BATTLESHIP MAINE.

In a recent issue the Review discussed briefly the trial trip of the Cramp-built battleship Maine. It is now enabled to print a photograph of the warship upon her trial trip, showing her bow wave. The Maine's mean speed, uncorrected for tidal errors, was 17.96 knots. Her contract speed was 18 knots which, it is expected, will be exceeded when tidal allowance is given. She is a splendid warship and behaved beautifully during the trial. She is about once again as big as her namesake whose destruction led to the Spanish-American war. The leading particulars of the new Maine are:

Length on load water line	388 ft.
Breadth, extreme	72 ft. 2½ in.
Displacement at trial draught of 23½ ft	12,500 tons.
Freeboard, forward at the bow	20 ft.
Freeboard, aft at the stern	13 ft.
Height of axis of forward 12-in. turret guns above water	26½ ft.
Height of axis of after 12-in. turret guns above water	19 ft.
Height of axis of main deck 6-in. R. F. broadside guns	15¼ ft.
Height of axis of upper deck 6-in. R. F. broadside guns	23¾ ft.
Height of axis of machine guns in upper tops above water	76 ft.
Height of axis of machine guns in lower tops above water	60 ft.
Height of sight holes in conning tower above water	34½ ft.



The new battleship Maine on her trial trip. *Photograph copyrighted by W. H. Rau, Philadelphia, Pa.*

The main battery consists of four 12-in breech loading rifled guns, and sixteen 6-in. rapid fire guns; the 12-in. are installed in two Hichborn balanced turrets, 11 in. thick, located on the center line and mounted in circular barbettes 12 in. thick, extending down to the protective deck. Twelve of the 6-in. guns are mounted in broadside on the main deck, two of which can also fire directly ahead. The remaining four 6-in. guns are mounted on the upper deck amidships on each side, two being able to fire directly ahead and two directly astern as well as on broadside. The secondary battery consists of twenty 6-pounders, six 1-pounders and four Gatlings, with one 3-in. rapid fire field gun. The 6-pounders and other secondary battery guns are located on the after berth deck, upper deck, bridges and in military tops. There are also two submerged torpedo tubes, one on each side below the protective deck, forward of the forward turret. The Maine carries eight 17-ft. torpedoes. They are the first under-water torpedoes introduced into the United States navy, though they are being used very generally in all battleships building abroad. The 6-in. and 12-in. guns are 40 caliber, with a muzzle velocity of not less than 3,000 ft. per second for the 12-in. guns.

The water line belt is 7½ ft. in depth, that is extending from 4 ft. below the water line to 3½ ft. above it, and from the stem to abreast the after side of the after barbette. The maximum thickness is 11 in., tapering from that thickness at 1 ft. below the water line to 7½ in. thick at the lower edge. It also tapers from the maximum thickness abreast the turret to 4 in. thick at the stem. Protection to the after end of the vessel is provided by a heavy protective deck made of 120-lb. plates. The casemate armor protecting all the 6-in. guns is 6 in. thick. There are also splinter bulkheads, in thickness 1½ in., located between the guns to localize any damage in action. The conning tower and shield are each 10 in. thick, with an armored tube 7 in. thick extending below to the protective deck. The signal tower is cylindrical in shape, 6 in. thick, and located forward of the after turret. The protective deck extends for the entire length of the vessel, the outer edge being 4 ft. below the water line. The lower course is of 40-lb, plates; the upper course on the flats 62½ lb., and on the slopes 70 lb., with 120-lb. plates aft over the steering gear. Protection is further assured by a cofferdam worked entirely around the vessel in the neighborhood of the water line, in which is packed between 40 and 50 tons of corn-pith cellulose.

A double bottom built of ⅜-in. inner bottom plates, is worked the whole length of the machinery space and also under the magazines forward and aft. This space is sub-divided into numerous watertight compartments, in order to localize any injury that may occur to the bottom of the vessel. These compartments are connected by means of pipes with the drainage and pumping systems of the vessel, so that water may be carried in these spaces for trimming purposes, or pumped out as required. Large and small, there are about 400 compartments, mostly watertight throughout the vessel. In addition to the protection given by the armor and cofferdams, the boilers and engines are surrounded by a deep body of coal, the coal bunker capacity being fully 2,000 tons, an unusually large quantity in a vessel of this size.

The motive power consists of triple-expansion, twin-screw propeller engines, with Niclausse water-tube boilers to indicate about 16,000 H. P., with assisted draft. The engines are vertical, three-cylinder of a collective power of about 8,000 H. P. each. The working pressure in the boilers is about 256 lbs. per square inch, and 200 lbs. per inch at the engines. The boilers are placed in watertight compartments separated by middle line bulkhead. The diameter of the high pressure cylinder is 38½ in. that of the intermediate cylinder 59 in., and the diameter of the low pressure cylinder 92 in., length of stroke of all pistons 42 in., and the number of revolutions on trial were between 122 and 130 per minute. The screw propellers are three-bladed, made of bronze and about 14½ ft. in diameter. The boilers are twenty-four in number, arranged in three groups. The total amount of heating surface is 58,104 sq. ft. and the grate surface 1,353 sq. ft. The smoke pipes are three in number, and in height about 90 ft. above the level of the grates.

CANADIAN FAST LINE.

Some Figures to Prove that the St. Lawrence River Route is Out of the Question—A Definite Proposal for the Line—Description of the Cedric—A New Shallow-Draught Steamer.

(From Our London Correspondent.)

London, Sept. 1.—There can be no doubt that just now a number of very acute brains are working upon the problem how to shorten the Atlantic passage. The Morgan combine has stimulated interest in the question, and coupled with it is the natural aspiration of Canada to be in more direct and speedy touch with this country. There are many difficulties in the way, the worst being physical. To begin with, the St. Lawrence river is notoriously a very ticklish channel to navigate. If one is in no hurry, it is very pleasant steaming up to Montreal. I have enjoyable recollections more than once of a very jolly three days spent between the Straits of Belle Isle and Montreal. The last time I crossed over from Liverpool by the Northern circle, although I could not get the captain to admit it, yet I am practically certain that we circled once or twice outside the strait. The fog suddenly rose, and my impression distinctly is that it cleared so quickly that the captain had not time to point his vessel, with the result that more than one of us had a suspicion that our stern was nearer the straits than our bow. However, that is merely the impression of a land lubber. Then we did no navigation by night. The reason for this slowness is not far to seek. I have before me a list of important strandings of steamers in the St. Lawrence from 1896 to 1902, and a portentious list it makes. It has been prepared by the Liverpool Underwriters' Association. As the waterway is only open six months of the year, the strandings occur in a period of about forty months. There are forty-one vessels in the list (only the important ones are noted), and they range in size from 1,100 to 7,100 tons. Few of them are under 2,000 tons. The total tonnage of the list is 150,527 gross, of which 31,282 tons were totally lost. In addition, the fact that the St. Lawrence is closed to navigation during the winter months renders it almost impossible to organize adequate railway service. If, for example, Montreal is the port for seven months, and Halifax the receiving port for the other five, it follows that this constant changing of route and port means that it will not pay to improve the railroad service between Halifax and Montreal, whereas if Halifax were the port all the year round, the present twenty-four hours railroad journey to Montreal could, with a little engineering, be divided by half, and the great boon of regularity obtained. Another point to be borne in mind is that regularity is not only good for the railway companies and for passengers making their various arrangements, but it also has a distinct influence upon marine insurance charges. It has been pointed out that the regular service between Liverpool and New York or Liverpool and Boston means that the officers learn what are the dangers to avoid, and so secure greater safety. This question of marine insurance is a vital one. I reported a fortnight ago that the Canadian government had been in semi-official conference with the British underwriters in London. Since then I have seen a statement as to the insurance rates charged by the two Canadian marine insurance companies, namely, the British-America and Western, and two American companies—the Aetna and the Insurance Co. of North America, who do a very small business on this class of ocean freight. Here are the particulars, which speak for themselves. The premiums received amounted to $556,933, the losses incurred to $381,374, and the losses paid to $376,667. At the end of the year the losses unsettled were $34,512. The inland marine business was less favorable than in the year before. The losses incurred amounted to 68.48 per cent. of the premiums received. The rates for 1899 and 1900 were 73.90 and 54.83 respectively. Ocean marine—the premiums received amounted to $687,654, the losses incurred to $542,702, and the losses paid to $536,402. At the end of the year the total outstanding, or unsettled, losses were $47,039. In the ocean business the rate of losses incurred to premiums received was 78.92 per cent., whilst in 1899 and in 1900 the rates were 80.16 and 83.39 respectively. One British company, (the British & Foreign Marine) is licensed to carry on the business of inland marine insurance and the business of insuring registered mail matter in transit from place to place in Canada, but did no inland marine business during 1901. The bulk of the inland marine insurance business on the great lakes is done on the American side, and the two Canadian companies which transact ocean insurance have not much business outside the St. Lawrence.

A DEFINITE PROPOSAL AND SOME FIGURES.

But the most definite proposal I have seen as to the fast Atlantic service emanates from Robert Reford, president of the Robert Reford Co., Ltd., of Montreal, who on August 7 wrote to the Times advocating a quick ocean service between Halifax, N. S., and Galway, on the west coast of Ireland. "The distance (I quote Robert Reford) between Galway and Halifax being about 2,150 miles, as against 3,150 between Liverpool and New York, or 2,940 between Liverpool and Montreal, making the ocean crossable at this point—Galway to Halifax—by steamers of 24 or 25 knots speed in three days, as against seven to eight by the St. Lawrence or New York routes. Add to this ocean passage of three days, twelve hours between London and Galway and fifteen hours between Halifax and Montreal, and you obtain a possible time of transit between London and Montreal of a fraction over four days, or less than one-half possible via New York or any other route—a condition of things of such importance to the interests of Great Britain and Canada as to lead, I think, to this route having claims above all others, even if the working of it cost double the money necessary to subsidize the slower routes, and it possessed no other advantages. It does, however, possess other advantages pre-eminently great, so marking it out as the coming route not only between Great Britain and Europe and Canada, but as the highway of travel between Canada, Europe, Asia, and Australia. Among its advantages I will mention the following:

"Owing to the shortness of the passage, only half the number of steamers necessary to compose a weekly line between New York and Liverpool, or Liverpool and Montreal, will suffice. In other words, four steamers are the least required to give a weekly service between New York and Liverpool, or Liverpool and Montreal, and two can perform the service between Galway and Halifax, so cutting down the expenses of the line enormously—viz., half the capital required for initial cost of steamers, half the insurance, half depreciation, half the interest, half the bill for wages, food and every other expense, including coal, and adding to the saving in this article's cost the space taken up by coal for reception of cargo; and, if Galway and Halifax were made free ports for the encouragement of the traffic, as I think should be, and could be, arranged by the Imperial and Dominion governments, the immense expenses now incurred at Liverpool and New York could almost entirely be saved. So great would the entire saving be in expenses that I think a tri-weekly line consisting of six steamers could be run as cheaply as a weekly line of four steamers between Liverpool and New York."

To the objection apparently urged that freight could not be found for a service such as this, Robert Reford remarks:

"Not only could these steamers find freight, but, owing to their small consumption of coal, would have space for double the amount of cargo of boats running to New York or elsewhere, and would get this freight at big rates owing to their great speed.

"The amount of perishable and high-class freight is increasing year by year, and no other line of route possesses equal advantages for handling it. The eastern provinces of Canada, which are rapidly becoming immense producers of cheese, butter, fruit, paper, pulp and mild-cured meats and fish, would, I feel sure, alone provide sufficient cargo for a tri-weekly line, if not a daily; besides which I feel sure there would be an immense demand for this space from the western states and California for fruit and meats of all kinds, and that at much higher rates than obtainable by competing ships via New York, where the competition is great and speed insufficient."

Mr. Reford has been at the trouble of making estimates of capital and working expenses involved in a bi-weekly line of steamers between Halifax and Galway, as against bi-weekly service between New York and Liverpool. He figures that five large steamers of twenty-five knots, to cost £500,000 each, would do for the Halifax-Galway service, while nine such vessels would be required for the New York-Liverpool service. The five steamers for the proposed new line could be operated, he thinks, with the subsidy taken into account, at an annual cost of £144,600, as against an outlay for similar service between New York and Liverpool on the same basis and items of expense of £1,804,400.

THE POLITICAL ASPECT.

A proposal so far reaching and so subversive of present arrangements is bound to be severely canvassed, not only by Liverpool and Southampton interests, which will be directly challenged, but also on political grounds. Robert Reford urges that a four days' transit between London and Montreal would advertise Canada and bring through her the bulk of the travel between Europe, Canada, the western states, Asia and Australia. By this route Japan could be reached from London in less than twenty days, China in twenty-four days, and the circuit of the world in forty days. Again, he thinks that the scheme must prove beneficial to Ireland, making the old country known to strangers, and opening to the gaze of the Irish people a new world and new ideas. In this way the prosperity of the country could be improved and Irish discontent allayed, the argument being that the Irish people would be quick to see and acknowledge that this new prosperity was owing to their connection with Great Britain, just as now they see the trade of the world passing their shores, enriching England and Scotland, but doing Ireland little good; all of which has a certain modicum of truth.

NEW WHITE STAR LINER CEDRIC.

Following are particulars of the new White Star liner Cedric, perhaps the largest vessel in the world, launched recently from Harland & Wolff's yard in Belfast: The length of the Cedric is 700 ft., her beam is 75 ft. (7 ft. wider than the Oceanic), and her depth 49 1/3 ft. She is about 21,000 tons gross. The displacement at her load draught will be 37,870 tons. The Cedric has no fewer than nine decks, and is built on the cellular double-bottom principle, being divided into numerous watertight compartments. The engines are of the Harland & Wolff quadruple-expansion balance type. The Cedric has accommodation for about 3,000 passengers, besides quarters for a crew of about 350. In addi-

tion to the ordinary state rooms there are suites consisting of bed, sitting, and bath rooms for families. There are also single-berth state rooms, practically a new feature in ocean liners. The first-class accommodation is all arranged amidships on the upper decks, and the number of such passengers provided for is 365. The grand dining saloon is on the upper deck, and extends the full width of the ship—75 ft. It contains seating accommodation for over 300 persons. Aft, on the upper and bridge decks, there is accommodation for 160 second-class passengers, excellent not only in regard to bedrooms, baths and lavatories, but in saloon, smoking room and library. An unusually large number of third-class passengers are provided for on the upper-middle and lower decks, some in separate cabins and others in open berths forward. There are separate galleys or kitchens for all three classes of passengers; also separate pantries equipped in the most approved and modern style.

NEW SHALLOW-DRAUGHT STEAMER.

Yarrow & Co., the well known Thames ship builders of Poplar, this week ran a preliminary trial of a new type of shal-draught is, of course, essential to navigation. She is 75 ft. long low-draught screw steamer. This vessel has been built for trading purposes on South American rivers, where shallow- by 9½ ft, wide, and will carry, when fully loaded, 20 tons. So far as the engines and boilers are concerned, the machinery presents no novel features. The propeller, however, is so placed that with a diameter of 2½ ft. it can be fully immersed when the boat is drawing no more than 11 in., and that without its projecting below the bottom. In vessels previously constructed, the after part of the bottom, or "run" was made very flat. The central part of the bottom plating has been arched up so as to form a tunnel in the after part. This tunnel is not only arched in cross section, but also in longitudinal section, its highest point rising consderably above the normal water plane. In this tunnel, the screw revolves, the propeller shaft going through a stuffing box in the plating much as usual. Thus the screw in the old type was not completely immersed, and its efficiency accordingly very much discounted. In the tunnel boats, the propeller drives out the air from the crown of the tunnel as soon as it begins to revolve, and the pressure of the atmosphere on the surface of the surrounding sea drives water up to fill the vacuum. In this way, so long as the vessel is going, the screw is completely submerged, working with a maximum efficiency in solid water. In most screw vessels, excepting those of deep draught, the tendency of the propeller is to draw down air, and this often leads to a serious loss of power. In the case of vessels of this type the steel plating of the tunnel, which almost surrounds the screw, prevents this undesirable action. The full description of how Yarrow & Co. have overcome the difficulties thus presented is thus given:

In order to reach the end described, it should be remembered, the bottom edges of the tunnel must be beneath the normal water plane; otherwise the vacuum would not be formed, and the water would not rise to cover the propeller. This, however, leads to a serious drawback in the system. The propeller race, or water sent aft by the screw, is largely thrown against the downward sloping after part of the tunnel; and, though the latter is eased off to as flat an angle as possible, this deflection of the race naturally absorbs a great deal of power. This is more especially the case when a vessel is loaded; for, naturally, the boat must be designed for the edges of her tunnel to be immersed even when she is at her lightest draught. It is in order to overcome this defect that Yarrow & Co. have invented the new arrangement of tunnel which is the distinctive feature of the boat tried this week. In place of the tunnel dipping down again as it goes aft, after reaching the greatest height, it is carried along with the top of the arch parallel with the water level. The exit astern is therefore above the water level, so that air would be admitted, thus vitiating the principle, were not special means taken to prevent it. Aft of the propeller is a hinged flap or shutter made of plate steel. This is so arranged that it hinges on the roof of the tunnel; its forward end—where it hinges—being just aft of the propeller. When this flap is lowered its after end dips under water, and it thus forms an after downward inclined roof to the tunnel and enables the vacuum to be formed and the water lifted when the screw revolves in the manner already described. It should be stated that the tunnel is made of rectangular section where the flap is. By this ingenious device Yarrow & Co. have overcome the one great objection to the tunnel-enclosed method of screw propulsion; which, in spite of the drawback to which reference has been made, has been found to possess great advantages for shallow water service. Up to recent times it has been considered that paddle-wheel steamers were necessary for such purposes, because immersion could not be obtained for the screw. With side-wheel steamers the extra width needed was often a serious objection in new countries and narrow channels. The stern-wheel arrangement overcomes this difficulty, but in all paddle-wheel vessels the machinery is both expensive and heavy, and its weight presents another serious difficulty when light draught is a necessary feature. A screw engine will make two or three revolutions to one of a paddle steamer, and with equal power developed would be very much lighter. At varying draughts the paddle-wheel with radial floats is a very inefficient instrument; that is to say, it is efficient only at the draught for which it is designed; and when feathering floats are used the cost of up-keep is greatly augmented, owing to the wearing of bushes and joints. In some waters the up-keep of the feathering paddle-wheels is equal in cost to that of the engines themselves. In regard to practical results, it may be stated that the steamer to which reference has been made has steamed at the rate of 9½ miles per hour on a draught of 11 in. With a load of 10 tons the draught was 20 in., and the speed 8¼ miles per hour; and with 20 tons on board the draught was 28 in. and the speed 7¾ miles. With a medium load, 10 tons, the fitting of the new arrangement enabled the speed to be increased over half a mile an hour, the same power being developed by the engines. This represents an increased efficiency of 25 per cent. since the power required increases approximately as the cube of the speed at these rates of steaming. At light draught, i.e., with no load on board, the result was naturally not so marked, but still the gain was considerable, over a quarter of a mile per hour. In view of these facts it may be safely said that Yarrow & Co. have introduced a system which gives results for light-draught navigation superior to those yet obtained from any class of paddle-wheel vessel.

SHIP BUILDING DURING AUGUST.

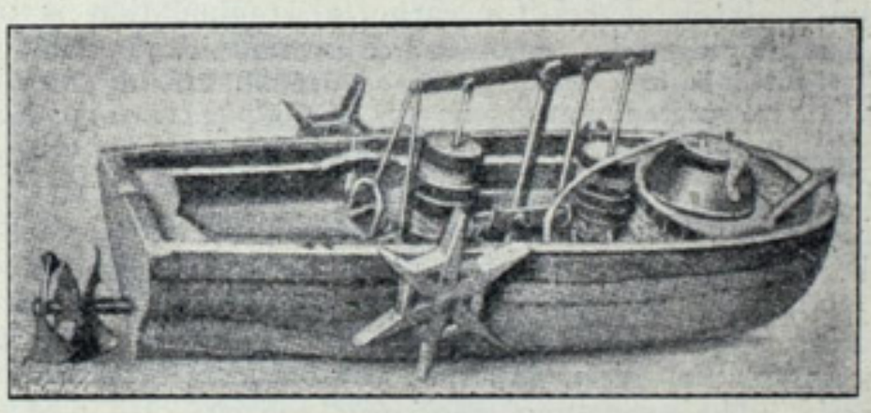
The bureau of navigation reports that 119 vessels of 31,469 gross tons were built in the United States during August as follows:

	WOOD.				STEEL.				TOTAL.	
	SAIL.		STEAM.		SAIL		STEAM.			
	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.	No	Gross.
Atlantic & Gulf	48	7,785	18	526	..	.....	6	13,316	72	21,627
Porto Rico....	2	58	...	.....	..	.....	...	...	2	58
Pacific.....	11	4,783	10	1,939	..	.....	1	263	22	6,985
Hawaii	1	6	...	.....	....	.....	....	.....	1	6
Great Lakes...	1	23	7	743	....	....	....		8	766
WesternRivers	..	....	13	548	..	....	1	1,479	14	2,027
Total	63	12,655	48	3,756	....	.....	8	15,058	119	31,469

The largest steamer in this list was the Siberia, built by the Newport News Ship Building & Dry Dock Co. for the Pacific Mail Steamship Co.

THE FIRST STEAMBOAT.

What was probably the first steamboat was built by John Fitch, and is shown below. It was only 4 ft. long, and at first only had paddle-wheels. This was run in a pond near Davisville, Bucks County, Pa., in 1785. Five years later, 1790, he fitted a boat with steam-driven oars and ran it on the Delaware river, near Philadelphia. The photograph is from a 26-in model of a yawl which ran with a screw on Collect Pond, New York city, in 1797. The construction can be seen from the photograph,



Fitch's Steamboat.

and is, of course, very crude and open to criticism, but the boat ran, and John Fitch deserves much more credit than he receives from the world at large. In the popular mind everything in steam engines is due to Watt, in steamboats to Fulton, in locomotives to Stephenson, and in electricity to Edison. Needless to say—and without detracting a particle from the true fame of each—they are all wrong.—*Railway and Locomotive Engineering.*

It is announced in New York that Charles R. Flint's yacht, the Arrow, designed by Charles D. Mosher, has beaten the record for speed which was held by the British torpedo boat Viper. In a speed test on the Hudson she made a knot in one minute and thirty-two seconds which is at the rate of 39 13-100 knots or 45 6-100 statute miles an hour. The Arrow's dimension are: Length over all, 130 ft. 4 in.; length on water line, 130 ft.; extreme beam, 12 ft. 6 in.; draught under screws, 4 ft. 11 in. She has two quadruple-expansion engines, capable of developing 4,000 H. P. During her test she carried 400 lb. of steam in her boilers and 375 lbs in the engines.

The Hardy Ship Building Co., Tacoma, Wash., will shortly have completed two excellent vessels. The first is the passenger steamer Georgia, 110 ft. long and 22 ft. beam. She will cost approximately $40,000. The John C. Myers, a four-masted barkentine, is being built for Ludden & Christensen of San Francisco. She will be 200 ft. over all, 186 ft. keel, 41 ft. beam and 15 ft. 6 in. deep.

SHIPPING MATTERS IN SCOTLAND.

Glasgow, Aug. 29, 1902.

A rather absurd paragraph has been going the rounds of the papers in England. It is to the effect that the Morgan combine are going to make a new departure with their fast steamers. After a certain speed is reached it is said every additional knot involves not only enormous coal consumption, but also "rackets" a steamer so severely that the necessity for repair and overhaul is greatly increased which adds to the cost of maintenance. (But everybody knows that speed must be paid for). The policy of the Morgan combine it was announced, will be to reduce the speed of the "flyers" to a moderate and uniform rate. The saving in expenditure thus secured was estimated at 50 per cent. The German lines in the combine have, it was stated, agreed to this policy, but they deny it and marine men generally are much amused.

Among the many proposals for the new Canadian fast mail service is one advocating Milford as a terminal port. At the half yearly meeting of the Milford Docks Co., Mr. C. E. Newton, the chairman, said the negotiations for the steamship service with Canada were now prominently before the public. All that they had ever asked for Milford as the terminal port was that it might have due consideration on its merits, but they knew that merits were not the sole qualification for advancement in this or any other age, and that the motive power was money. They were told a few years since that America had no money, but it had now bought up some of our finest liners and given point to the Prince of Wales's advice, "Wake up, England." Canada was awake, and with statesmen like Sir Wilfrid Laurier and Lord Strathcona it meant busines now. With regard to the Atlantic fast line, Milford would not be overlooked in the selection of the terminal port. It was not afraid to enter the ring promised by Lord Onslow but there was a citadel of vested interests to be stormed, and Liverpool would say with the chairman of the North Western railway, "to take our traffic away would be robbery." Then they had the mistaken policy of the South Wales ports to weaken them—Newport, Cardiff, and Swansea—with no more chance now of being chosen as the terminal port for the fast line than Llanelly or Neath. Liverpool, Southampton and Milford, he said, were the only ports in the running. It is however, doubtful if Milford *is* in the running, with all respect to Mr. Newton.

The mail and passenger service carried on between Fleetwood and Belfast by the large and fast vessels sailing under the joint ownership of the Lancashire & Yorkshire and London and North Western railway companies, requires an addition to their fleet, which has just been built by John Brown & Co. (Ltd.,) Clayebank. This vessel is of the following dimensions: Length between perpendiculars, 315 ft; breadth, molded, 38 ft.; depth, molded, 17 ft. 6 in., and gross tonnage about 1,800 tons. She has been constructed to Lloyd's highest classification, and to the requirements of the board of trade for passenger certificate. In addition to large spaces for cargo, accommodation is provided amidships on the main, upper and promenade decks for about 400 first-class passengers, and in the poop for about 400 steerage passengers. The first-class dining saloon is a large and handsome apartment on the upper deck, and occupies the full width of the ship, and on the promenade deck above is a well appointed smoking room. The spacious promenade is under shelter of a long boat deck, part of which is also given to the use of first-class passengers, and the fore part of which is railed off for the navigating staff. The engineers and officers are berthed in a deckhouse on the poop, and the crew's accommodation is in the forecastle. The propelling machinery consists of a pair of twin-screw, vertical, triple-expansion engines, each operating four cranks, and specially designed in the matter of balancing, so as to reduce vibration to a minimum. Steam is supplied by four large single-ended boilers fitted with forced draft and there is, in addition a powerful donkey boiler for use with the windlass, winches and other deck machinery. A complete equipment of electric lighting has been installed, and the ventilating and sanitary arrangements are well planned and up-to-date in all respects. The vessel is rigged as a two-masted, fore-and-aft schooner, and has been built on very fine lines, with a view to high speed. It is only a few years since it was decided to abandon the side-wheeler on this route, and adopt twin-screw boats, of which the Duke of Connaught is the fifth.

A few days ago Barclay, Curle & Co. (Ltd.,) launched from their Clydeholm ship building yard the twin-screw steamer Commonwealth, built to the order of Mr. W. Lund, London, for his Blue Anchor line for passengers and goods to Australia. The Commonwealth is built of steel throughout to Lloyd's highest class, and under their special survey. Her principal dimensions are as follows: Length, 466 ft. over all; breadth, 52 ft. 3 in.; and depth, molded, 33 ft. 6 in. to the upper deck. She is designed to carry about 8,000 tons deadweight, and to steam about 14 knots. Accommodation is provided for about seventy-five first-class passengers amidships in specially large and well lit and ventilated staterooms; the saloon, which is situated at the fore-end of the bridge, extending the full breadth of the vessel, is tastefully fitted up in polished oak and teak wood. A large music room, panelled in oak, and a smoke room in mahogany are fitted on the bridge deck. A boat deck is fitted over the full length of the bridge, forming a fine sheltered promenade for passengers. Third-class passengers to the number of seventy are accommodated in a long poop. The upper 'tween decks fore and aft are arranged to accommodate about 1,200 troops when required. The foreholds and "tween decks are insulated for the carriage of frozen meats, and to reduce the air to the necessary temperature a large installation of refrigerating machinery has been fitted. There are six large cargo hatchways, the arrangements for discharging cargo being of the most modern description, including twelve heavy derricks fitted on derrick posts, worked by twelve powerful steam winches. The machinery consists of two sets of triple-expansion engines, and four boilers, fitted with Howden's forced draft, capable of developing over 5,000 I. H. P. Bronze propellers are fitted, and an unusually large and complete outfit of spare gear and auxiliary machinery is provided for the engine room. The Commonwealth is the 439th vessel built by Barclay, Curle & Co.—a firm which dates from 1818, has built 750,000 tons of shipping and expended £16,000,000 in wages and material.

A new cable-laying steamer built by David J. Dunlop & Co., Port-Glasgow, has just been launched from their yard, viz., the steel twin-screw steamer Iris. This vessel has the appearance of a handsome and finely-lined yacht, her design being smart and rakish. Her dimensions are: Length on load line, 285 ft.; breadth, molded, 40 ft. 6 in.; depth, molded to spar deck, 25 ft.; gross tonnage about 2,300 tons. When the order for the construction of the vessel was placed in Messrs. Dunlop's hands by the Pacific cable board it was because it was recognized that the builders had already produced, with the most successful results, many steamers for cable laying and repairing purposes—notably H. M. S. Monarch, for the British government; the twin-screw steamer Tutanekai, for the New Zealand government; and the first cable laying and repairing steamer employed in German waters—the twin-screw steamer Von Podbielski. The Iris has been built to Lloyd's highest class as a spar-deck steamer, and is fully equipped beyond their outfit requirements. Four cable tanks are provided for the required cable capacity. The cable gear, viz., picking-up gear forward, bow and stern sheaves, and paying-out machinery aft—is all arranged for, and everything necessary for a vessel of this class.

There was launched recently from the Meadowside ship building yard of D. & W. Henderson & Co. (Ltd.) a finely modelled twin-screw steel steamer built for Messrs. Alfred Holt & Co.'s eastern trade. This vessel's dimension are: Length, 480 ft.; breadth, 58 ft. 3 in.; depth, molded, 35 ft. 10 in., and she is of about 9,000 tons gross. She is fitted throughout with electric light, and is replete with the most approved gear, including eighteen powerful winches, for the rapid handling of a large cargo. The machinery, constructed by the builders, consists of two sets of triple-expansion engines, each having cylinders of 23 in., 38½ in. and 65¾ in., with a stroke of 48 in., and working at a pressure of 200 lbs. The new vessel was named Ning Chow.

It will interest all nautical readers to know that wireless telegraph stations have been established by the Marconi company at the undermentioned places, and that messages can be received at these stations and forwarded to their destinations:

		Approximate Position.				
1.	Frinton-on-Sea, Essex. . .	lat. 51 50	N.	long. 1 14½	E.
2.	North Foreland, Kingsgate .	lat. 51 23	N.	long. 1 26½	E.
3.	Niton, near St. Catherine's Point, I. of W.	lat. 50 35½	N.	long. 1 17	W.
4.	Haven, northern entrance to Poole Harbor.	lat. 50 41	N.	long. 1 56¾	W.
5.	Lizard, a quarter of a mile westward of Lloyd's Signal Station	lat. 49 57¾	N.	long. 5 12	W.
6.	Holyhead, in the town . . .	lat. 53 18	N.	long. 4 38	W.
7.	Rosslare, three-quarters of a mile north of railway station	lat. 52 17	N.	long. 6 24	W.
8.	Crookhaven, half a mile westward of village	lat. 51 28	N.	long. 9 44½	W.
9.	Malin Head, Lloyd's Signal Station.	lat. 55 22¾	N.	long. 7 22½	W.
10.	Innistrahull, Lloyd's Signal Station.	lat. 55 26	N.	long. 7 13½	W.
11.	Borkum River, Ems. Germany	lat. 53 34¾	N.	long. 6 40	W.
12.	Borkum Light Vessel, Germany	lat. 53 49	N.	long. 6 17	E.
13.	Nieuport, Belgium	lat. 51 9	N.	long. 2 45	E.
14.	Belle Isle, Labrador	lat. 51 53	N.	long.55 22	W.
15.	Chateau Bay, Labrador . .	lat. 51 59	N.	long.55 52	W.
16.	Sagaponack, near Sag Harbor, Long Island, U. S. A.	lat. 41 0	N.	long.72 18	W.

The success of the two turbine passenger steamers on the Clyde is calling forth various projects for the further utilization of this class of sea motor. One is with regard to the Dover and Calais cross channel service. Messrs. Denny of Dumbarton have, it is reported, received from the South Eastern & Chatham Railway Co. an order for a turbine steamer which is to be delivered for next season's traffic, and which for speed, comfort, and convenience will revolutionize the cross-channel passage.

The Dover-Calais route will be the first upon which this new type of steamer will be employed on the high sea. The length of the vessel is to be 300 ft. and she will have a beam of 40 ft., which is 5 ft. to 6 ft. wider than any present cross-channel steamer. This will give a magnificent deck space, and add to the vessel's stability at sea, prevent rolling, and reduce the inconvenience of passengers to a minimum. The ship will be provided with every up-to-date convenience for such a steamer, and will be entirely different from the present type of mail packet. The upper or promenade deck is to have an overhead shelter, so that when passengers step on board they can be protected in rough weather without going below. This new steamer will be provided with extensive cabin accommodation, the cabins being right down the ship's spacious decks. The turbine machinery occupies such a small space compared with the present heavy engines and machinery that a vast amount of additional space will be obtained for the use of passengers. As to speed, it is calculated that the cross-channel passage will be covered by this steamer in forty-five minutes at the outside, and probably, under favorable conditions, in less. The steamer will have five propellers and be fitted with rolling chocks to add to her steadiness at sea, and her engines will be capable of producing a speed of about 25 knots an hour without vibration. At present the highest average cross-channel steaming is one hour, five minutes. New turbine steamers are also being projected for the South coasting traffic.

Tenders have now been received by the admiralty for the building and engineing of the battleship to be given out to contract under the year's navy program. Also offers for supplying engines, boilers, and other auxiliaries for a battleship to be laid down at the Portsmouth dock yard. Both battleships will be of the same class as the King Edward VII., now building at Devonport dock yard. the Commonwealth building at Fairfield, and the Dominion building at the Vickers works at Barrow-in-Furness. These vessels are 425 ft. long, 78 ft. beam and of 43 ft. molded depth, and with a draught of 26 ft. 9 in. They will displace 16,350 tons. The five vessels now included in this class are 1,350 tons greater than any of the ships of the line in the British navy. In speed, however, they will be behind the six vessels of the Duncan class now being completed, which will, steaming on their full power trials, make 19 knots, while the new ships will make 18½ knots. The power is the same, 18,000 I. H. P., but more weight is given over to armor and guns in the new vessels. Their complete broadside is clad from 5 ft. below the water line right to the upper deck with hardened plates varying from 9 in. to 7 in., and right forward to the ram, where it is 4 in. in thickness. These ships, in addition to the usual twin pairs of 12-in. guns in barbettes, will carry four 9.2-in. guns in four smaller barbettes, as well as ten 6-in. quick-firers, fourteen 12-pounders, ten 3-pounders and two Maxim guns, with five submerged tubes for firing torpedoes. This armament is superior to that of any ship in the British navy. The machinery will be much the same as that of the King Edward VII., which has a combination of Babcock & Wilcox and cylindrical boilers. There will be four cylinders working on the triple-compound principle, the high-pressure cylinder being 38 in., the intermediate 60 in. and the two low-pressure cylinders 67 in. in diameter, with a stroke in all cases of 48 in. The full power will be realized with 120 revolutions. The contract ship will have cylindrical boilers for one-fifth of the power and Babcock & Wilcox boilers for the remainder. The dockyard-built ship will have Niclausse boilers for four-fifths of the power, the remainder being got from cylindrical boilers, worked under the Howden system. The boiler pressure in both cases will be 210 lb. per square inch.

Another new Anchor liner has just been launched by Alexander Stephen & Sons, (Ltd.,) Glasgow. This vessel is of the following dimensions: Length, 400 ft.; breadth, 49 ft.; depth, 30 ft. 9 in., molded; with a gross tonnage of 5,100 tons. She will be supplied with a set of triple-expansion engines, the cylinders being 26 in., 43 in., and 71 in. diameter, by 4 ft. stroke. There will be two double-ended boilers working at a pressure of 180 lb. This latest addition to the Anchor Line fleet is intended for their Indian service, and has been built to the highest class of the British corporation registry. Superior accommodation has been provided on the bridge deck for a large number of first-class passengers. The main saloon is a very handsome apartment situated on the bridge deck, well lighted and well ventilated. The decoration is bright and artistic, and the furniture and general appointments are very handsome. The state rooms are aft of the main saloon, and consist of large, airy, and well-lighted two and four-berthed rooms. From the main saloon a handsome stairway leads to the promenade deck, where a spacious music room is provided. At the other end of the promenade deck there is a large, airy, and well-ventilated smoking room. The vessel has been fitted with all the latest improvements for the rapid working of the large cargo which she has been designed to carry, including ten powerful steam winches. An insulated chamber for storing meat and vegetables has been provided, which will be kept constantly cool by a large refrigerating machine placed in the engine room. The new liner, which was named Massilia, is the first vessel built by Messrs. Stephen for the Anchor Line since it became a public company.

According to a parliamentary paper which has just been issued, it would appear that there is an ambiguity in the phrase "British shipping" which renders some explanation necessary. Under the existing law (8 and 9 Vict., c. 88, s. 13) no vessel is admitted to be a British ship unless registered as such, and navigated by a British master, and by mariners of whom three-fourths are British subjects. And no ship can be registered as British unless she be owned by British subjects and be built in a part of the British dominions. Thus there are now three elements in the idea of a British vessel—the ownership, the build and the navigation. But in some of the early statutes these three elements were not all required, particularly in the act of navigation, which generally takes no notice of the build of the vessels in which the importations and exportations are to be carried on. Among its provisions are these. That:

1. The plantation trade is confined to the two following classes of ships.
   (a) Ships owned by the people of England, Ireland, etc., and
   (b) Ships built in the plantations and owned by the people thereof.
   In both cases it is required that the ships should be navigated by British.
2. The trade between this country and Asia, Africa, and America is confined to ships owned by people of England, etc., or of the British possessions, duly navigated by English, nothing being said about the country in which the ships are built.
3. The European trade is confined
   (a) So far as relates to Russian goods, and the bulk of the enumerated articles to ships owned by people of England, etc., and duly navigated, or to ships of the country of export.
   (b) So far as relates to currants and Turkish goods to ships British-built and navigated, or to ships of the country of export.
4. The coasting trade is confined to British-owned and British navigated vessels.
5. In importations of fish double aliens' duties are charged on fish caught in other than British-owned vessels.

It is evident that out of seven provisions only two have any reference to the build of vessels, while of these two, one (3 b), has no reference to their ownership. On further examination of the navigation act it seems that exceptions from its general rules are in two instances (Levant goods and East India goods) made in favor of certain importations in British built shipping, while in two other instances (Spanish and Portuguese colonial goods and bullion and prize goods) they are in favor of importations in British-owned shipping. Provision is made in the tenth and eleventh sections of the act, for the prevention of frauds in the purchase of foreign-built ships, and for securing that such ships shall be wholly owned by British subjects before they can avail themselves of the privileges which the act confers on British-owned ships.

The shipping register for July shows that there has been an unusually large product of new tonnage and that the loss of tonnage from various causes has been remarkably slight. The result is a large addition to our merchant fleet. Of new steel steamers no fewer than forty-nine, with a gross tonnage of 120,045 tons, were added to the register during the month, which, with iron and wood vessels of small size make up a total of seventy-nine ships of 121,896 gross tons. The removals from the register comprises only eight steel steamers of 15,573 gross tons, twelve iron steamers of 5,701 gross tons, and wooden steamers and sailing vessels of various types which bring the total up to sixty ships of 32,743 gross tons. These do not include the vessels transferred to and from colonial registry. Deducting 32,743 tons from 121,896 leaves a difference of 89,153 gross tons, which represents the gain in British tonnage for the month, being at the rate of over a million tons a year.

Mr. John Haug, engineer of the American Coke & Gas Co., 536 Bourse building, Philadelphia, is now building a plant at the Jones & Laughlin steel works, Pittsburg for the manufacture of coke and gas by the Lowe process. The plant will have a daily capacity for the manufacture of 100 tons of coke and 1,500,000 cu. ft. of gas. The Lowe process differs from the ordinary beehive process of making coke in that it secures the gas as well. The complete apparatus to produce the quantity mentioned covers only 40 by 133 ft. It is expected to be ready for operation within a month.

The five-masted schooner Paul Palmer, built by George L. Welt, Waldoboro, Me., for William F. Palmer of Boston, was recently launched. She has two complete decks with orlop decks fore and aft. Her dimensions are: Keel, 254 ft.; beam, 44 ft.; depth of hold, 25 ft.

It is understood that the new steamship to be built by Harland & Wolff, Belfast, Ireland, for the White Star line will be 20 ft. longer than the Cedric recently launched.

AT THE JENKS SHIP BUILDING CO.'S YARDS

A spirit of energy pervades the yards of the Jenks Ship Building Co. at Port Huron, Mich. The company has just delivered the wrecker Thomas F. Newman to the Great Lakes Towing Co. and believes it to be the most thorough-going vessel of its kind on the great lakes. It has under way a duplicate of the Henry Steinbrenner for the Cowle Transportation Co. of which Capt. W. W. Brown of Cleveland will be the manager. She will be known as the John B. Cowle and it is expected that she will go into commission this fall. Her dimensions are: Length over all, 440 ft.; keel, 420 ft.; beam, 50 ft.; depth, 28 ft. She will have a triple-expansion engine with cylinders 23, 38, 63 in. in diameter with stroke of 40 in. Steam will be supplied from three Scotch boilers 12½ ft. wide and12 ft. long. As she differs in no way from the prevailing type of vessel she merits no further description. The company is also building the hull of a new fireboat for the city of Detroit of the following dimensions: Length over all, 122 ft.; beam, 25 ft.; depth, 13 ft. The engines of the old fireboat Detroiter will be installed in the new tug. The new fireboat will be a very staunch vessel indeed. Her keel and stem is to be of wrought iron, 5 in. by 1½ in., properly scarfed together and grooved to take the lower edge of intercostals. The stern post is to be of cast steel, properly scarfed to keel. The rudder frame is to be solid forged, stock 5½ in., pintle 3¼ in., plates 11 in. The main frame is to be constructed of angles, 4 in. by 4 in. by 9.8 lbs., spaced 15 in. apart forward of No. 17 and 20 in. for the remainder. The bulkhead frames are to be double 3 in. by 3 in. by 8 lbs. The reverse frames are to be angles 2½ in. by 2½ in. by 5 lbs. The engine, fire pump bearers and thrust bearing are to be of steel plates and angles. Suitable bearers are also to be provided for feed pumps, electric generator and all other machines. The deck and pilot house is to be of steel. The skylight over the engine and boiler room is to be of steel angles and plates, gratings of white ash to be fitted on top of pilot house and aft end of deck house. The tug is to have a gypsy steam capstan. It is to be lighted throughout by electricity for which the General Electric Co. will furnish the engines and generators. A monitor made by the Fabric Fire Hose Co., No. 88 Murray street, New York, is to be connected with the fire pumps. The tug is to be completed by Dec. 15.

By the end of the present month the company will deliver to Maj. J. G. Warren, lighthouse engineer at Milwaukee, the lighthouse tender Hyacinth. She is 160 ft. long, 28 ft. beam and 14 ft. deep and is equipped with a fore and aft compound engine, 22 and 32 by 36 in. Steam will be supplied by two boilers 11.6 ft. in diameter and 11 ft. long. Her machinery is in and she is practically complete with the exception of the cabins.

The lighter, Thomas F. Newman, recently completed is a single decked steel vessel with topgallant forecastle for the accommodation of the crew and boiler room. The pilot house is on top of the forecastle. The after end of the deck is raised level to the rail, forming a half poop in which provision is made for stowing pumps. She has no propelling engines, being built solely in that respect with a view to being towed. Her general dimensions are: Length over all, 173 ft.; length between perpendiculars, 165 ft.; beam molded 36 ft.; depth, 15 ft. The lighter is built staunchly throughout. The stem is of the best hammered scrap iron forged in one piece, 7 in. wide and 1¾ in. thick. It overlaps the keel plate 8 ft. The rudder is of the balanced type. The floors are of channels 15 in. by 33lbs. per foot and flanged to conform to the shape of the vessel. The side frames are of channels 6 in. by 3½ in. by 15 lbs. per foot for three-fourths length amidships beyond which they are reduced to 13 lbs. per foot. They are spaced 24 in. apart except forward of collision bulkhead where they are closed in to 18 in. spacing. The center keelson is formed of a 14 lb. intercostal plate flanged to keel plate and connected to floors with double 3 in. by 3 in. by 7.2 lb. angle clips. The sister keelson consists of a 12.5-lb. intercostal plate, flanged to shell and clipped to floor with single 3-in. by 3-in. by 7.2 lb. angles. The keel plate is 48 in. wide by 20 lbs. per square foot, tapering at after end to 17½ lbs. per square foot. The main hatchway extends from forecastle bulkhead to poop bulkhead aft and is framed along each side with a 15 in. by 33 lbs. per foot channel, standing 6 in. above deck where it is doubled with a reverse channel 6 in. by 3½ in. by 15 lbs. per foot, which is riveted on top of deck plating. At intervals of 8 ft. a 15 in. by 33 lb. channel is fitted throughout the hatchway, extending the full width of the hatch and connected to the channel fore and aft on each side by double clips of 4 in. by 4 in. by 9.8 lbs. angles and by 15 in. bracket plates on under side. The deck beams are of 9 in. by 20 lb. channels spaced on every second frame and abreast of hatchway are connected to hatch fore and aft by double clips of 4 in. by 4 in. by 9.8 lb. angles, and to heads of frames by flanged bracket plates, 14 lbs. per square foot. Watertight bulkheads are fitted both forward and aft of the cargo hold and a division bulkhead in the center. As previously stated the boiler room is in the forecastle. The boiler is of the Scotch type, 5 ft. in diameter by 8 ft. long, fitted with one plain circular furnace and Shelby steel tubes 3 in. in diameter. A Pemberthy automatic injector is fitted for feeding the boiler. A No. 3 vertical duplex air pump, made by the New York Air Brake Co., is also fitted in the firehold bulkhead.

The lighter was designed by Mr. Robert Logan of Cleveland and with the McMyler hoist, the donkey engines, air compressors and pumps is a most serviceable vessel. She has already been called the marine ambulance of the lakes and is well fitted with her equipment to lighter cargoes and assist disabled or stranded vessels.

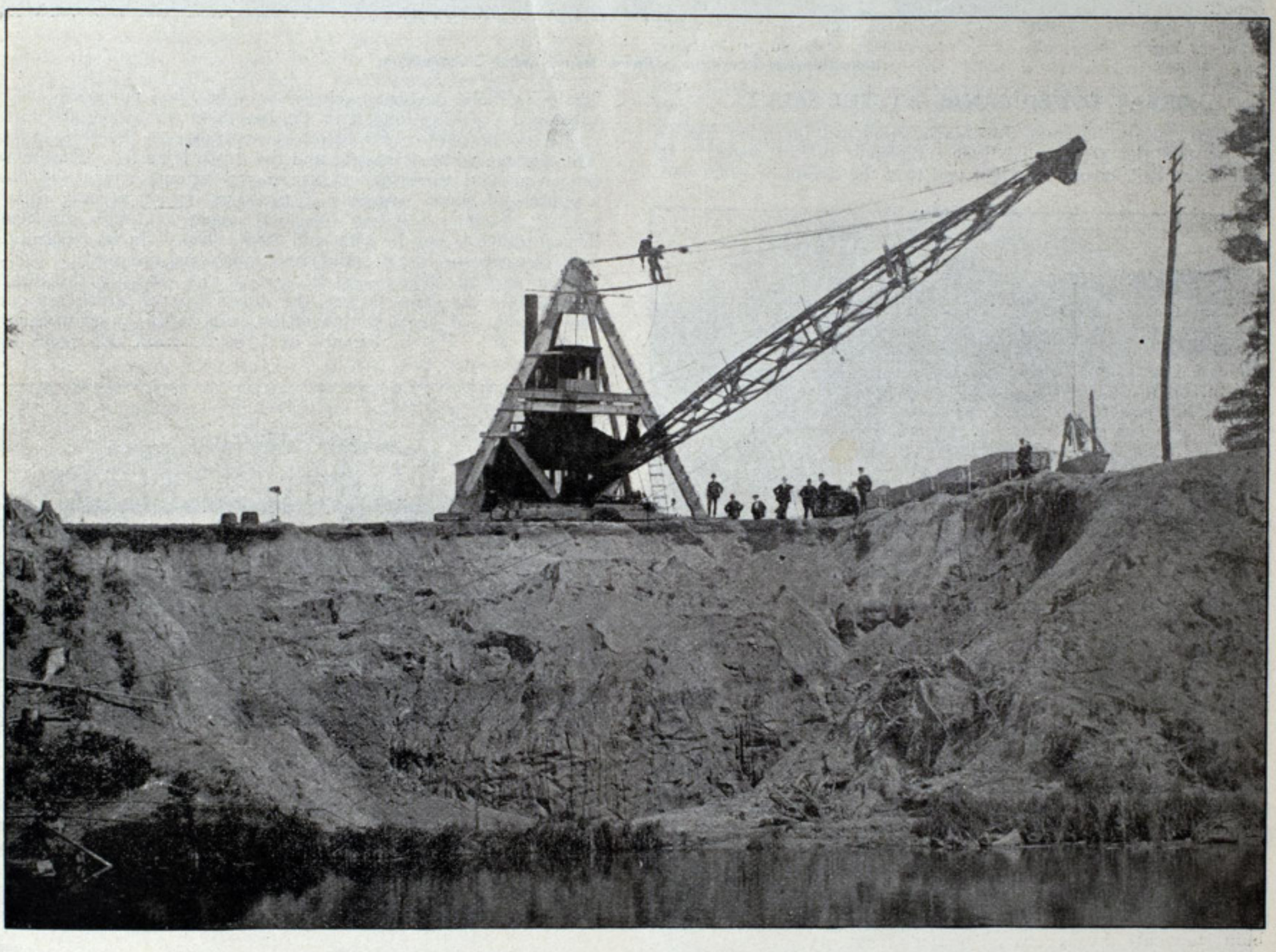
COLUMBIA IRON WORKS, ST. CLAIR, MICH.

Great progress is being made upon the construction of the plant of the Columbia Iron Works at St. Clair, Mich., and in a few months it will be in complete operation. The ship yard has a frontage of 1,800 ft. on the St. Clair river and embraces altogether about fifty acres. The company's initial contract is for the construction of a small cargo steamer for Chicago and Buffalo parties. The steamer's dimensions will be as follows: Length over, 215 ft.; keel, 200 ft.; beam, 39 ft.; depth, 16 ft. Her engine will be triple-expansion with cylinders 16, 26, 44 in. in diameter, with 36 in. stroke. Steam will be supplied by two Scotch boilers 12 ft. in diameter and 10.6 ft. long. Her hatches will be 12 ft. fore and aft and her beams will, therefore, be extra heavy to compensate for the added length of the hatch. The purpose of this departure in hatch construction is to facilitate unloading. She will cost approximately $100,000. Preliminary work has already been begun upon her though the company has had some difficulty in obtaining material. The company is also negotiating for the construction of three other vessels but the negotiations are not sufficiently advanced to warrant a more particular announcement. A while back a suggestion was made to the company of the advisability of constructing a cargo carrier with a hopper bottom which was held to have certain advantages, especially as a grain carrier, over the ordinary type of vessel. Prof. Durand the consulting engineer, gave the subject considerable thought and after weighing its advantages and disadvantages decided that its advantages were not sufficiently definite to compensate for the extra cost that such form of construction would avail over the old type. The company, therefore, decided not to undertake the experiment.

Everything, as might be expected, is trim about the yard. The buildings are the best that could be constructed for their various uses as far as convenience goes and their equipment throughout is of the latest and most modern design. The punch shop is 260 ft. long and 65 ft. wide. The second floor is carried upon steel trusses and is utilized as a mold loft, 200 ft. long and 65 ft. wide. A drawing office, 20 ft. long and 65 ft. wide is also upon this floor. The furnace and forge building is one story in height and is 150 ft. long and 50 ft. wide. The machine shop is 180 ft. long and 65 ft. wide with a gallery on one side, and an erecting wing 40 by 35 ft. The foundry is 96 by 65 ft. and is equipped with two cupolas, one of 7 tons capacity and the other of 2 tons. The power house is of brick 37 by 75 ft. The woodworking shop is a two-story building, 30 by 75 ft. Another building is devoted to the office and store room and is very commodious. The building berth, extending along the water front, is capable of accommodating three vessels at one time. All the buildings are so related to the ways as to diminish the handling of materials employed in the construction of the vessels to a minimum. The yards are thoroughly interlaced with railway tracks so that each building has a complete railway service. The company's equipment of machine tools is superb and among the manufacturers who contributed are the following: Hilles & Jones Co., Wilmington, Del.; Cleveland Punch & Shear Works, Cleveland; Reade Machinery Co., Cleveland; Acme Machinery Co., Cleveland; Betts Machine Co., Wilmington, Del.; Detrick & Harvey Co., Baltimore, Md.; Davis Machine Co., Rochester, N. Y.; Bickford Drill Co., Cincinnati, O.; Buffalo Forge Co., Buffalo, N. Y. The officers of the Columbia Iron Works are: J. E. Botsford, president; C. O. Duncan, vice president; F. D. Jenks, secretary and treasurer; Prof. W. F. Durand, consulting engineer.

DIGGING THE PORT HURON CANAL.

A work of some importance to the town of Port Huron, Mich., is now being performed by the Cuyahoga Contracting Co. of Cleveland. The town is bisected by Black river which is during the greater part of the year a dormant stream and consequently a menace to health. It was decided to construct a canal from Lake Huron to a point in the river above the town and thus flush the river whenever it was necessary to do so. The Cuyahoga Contracting Co. began work upon the canal last July and has promised to complete it by March next. It will be 5,800 ft. long, 112 ft. wide at the top and 25 ft. at the bottom with a 14-in. fall and is intended to carrv a stream of water 6 ft. deep. The admission of water will be regulated by gates at the Lake Huron intake. There will be no masonry work about the canal at all, it being a simple task of land dredging. The work is being performed by a Hayward dredge, the parts of which were supplied by the McMyler Manufacturing Co. of Cleveland and put together at Port Huron by the Cuyahoga Contracting Co. The boom of the bridge is of unusual length, being 75 ft. long and can therefore swing the bucket from one side of the canal to the other as desired. The bucket is of the orange-peel type with a reach of 8 ft. altogether, or 4 ft. in any direction from the center. When closed the bucket has a cubical capacity of 1½ yds. of material which is equivalent to 3 tons. The dredge engine, with cylinders 10½ by 12 in., lifts, lowers, opens and closes the bucket as well as propels the dredge upon its rollers. The swinging engine, with 8 by 8 in. cylinders, swings the boom from side to side. Four men are required to operate the dredge. The contract price for dredging the canal is $87,946.

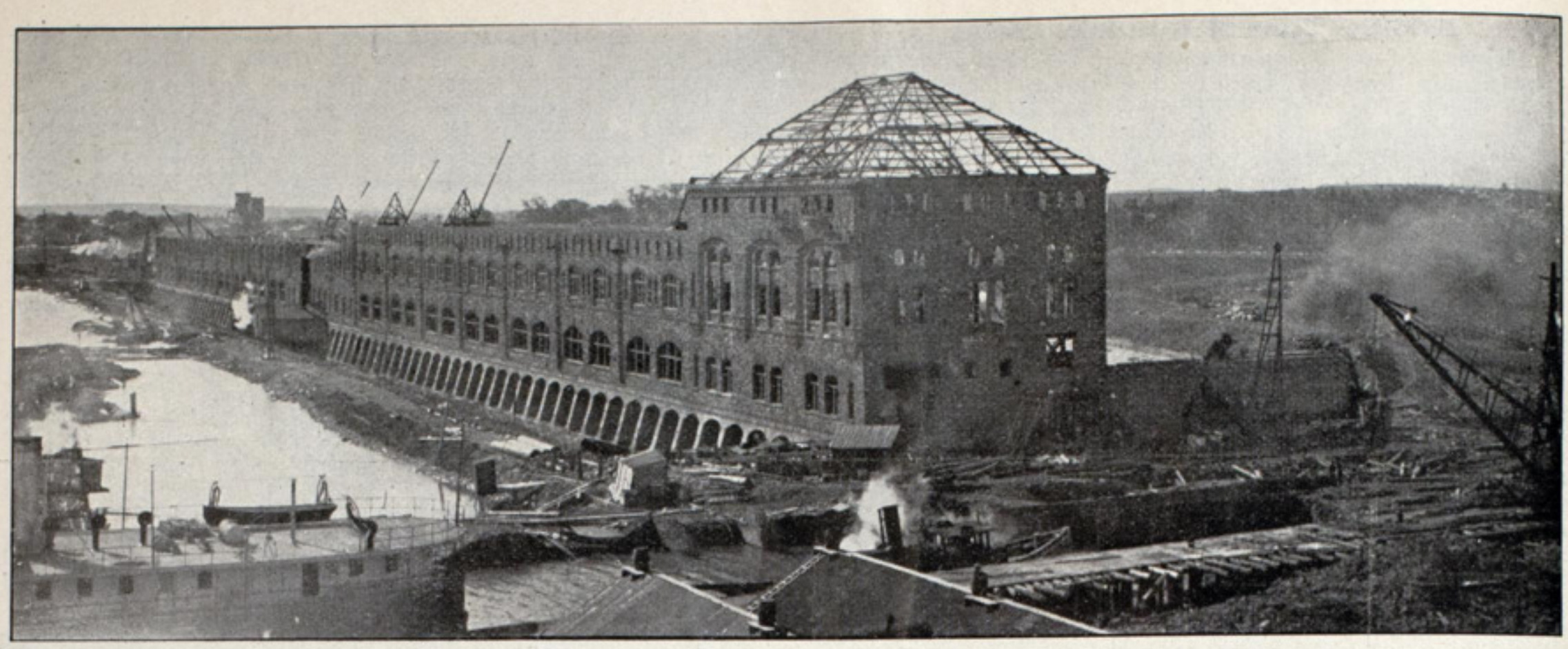


The Cuyahoga Contracting Co.'s Dredge at work on the Port Huron Canal.

CLEVELAND-CLIFF IRON CO'S GREAT PURCHASE

So quietly has the Cleveland-Cliffs Iron Co. gone about its work of development that very few people are aware of the extensive character of its operations. This company practically dates since 1846 when it sent a representative into the then unknown iron country of the Lake Superior region and secured the Cleveland mine on the Marquette range. It was the second mine to be located and the first to ship ore. Its historical value is, therefore, of the first consequence. Its history can be truly said to embrace the history of the whole upper peninsula of Michigan. About ten years ago it acquired the Iron-Cliffs Co. and changed its name from the Cleveland Iron Mining Co. to the Cleveland-Cliffs Iron Co. For many years it confined its attention to the business of mining and selling iron ores but upon the acquisition of the Iron-Cliffs Co. it began to spread. It acquired a charcoal furnace and so developed the business of making charcoal iron that it is now the leading charcoal iron producer of the United States. It has been steadily adding to its timber holdings until it now owns the choicest timber lands in the upper peninsula of Michigan. Its latest deal is the acquisition of the land grants of the Detroit, Mackinac & Marquette railway in Chippewa, Schoolcraft, Luce, Alger and Marquette counties, embracing over 1,000,000 acres. It is constructing railways to reach this timber and proposes to establish, through subsidiary companies, various industries to develop its vast holdings. The Cleveland-Cliffs Iron Co. is one of the most liberal and enterprising companies, and while it has done much for the upper peninsula it is quite clear that it intends to do much more.

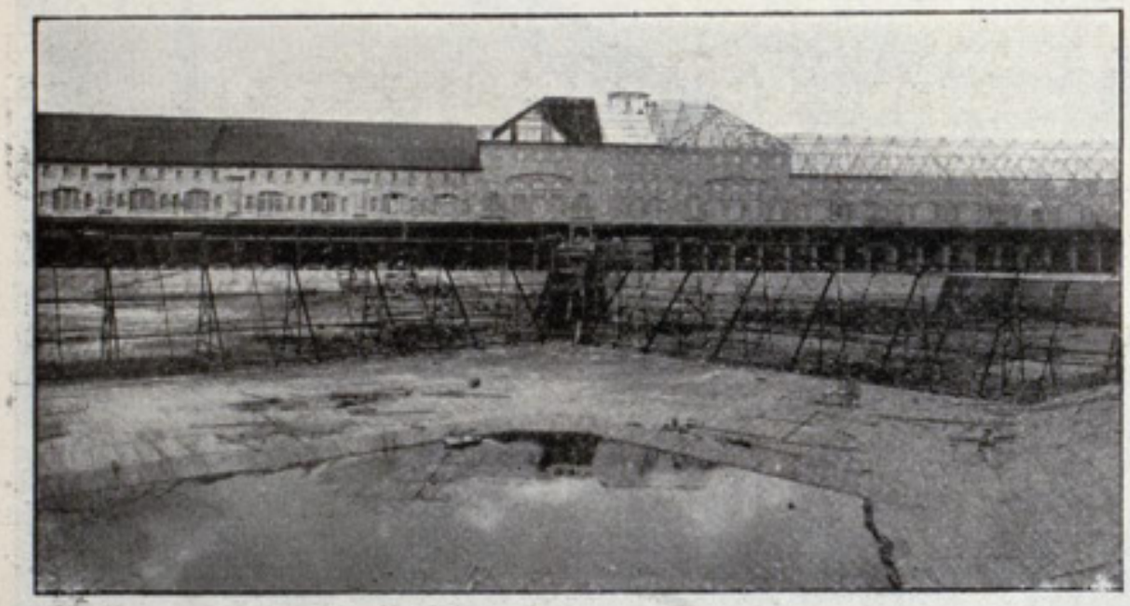
Capt. George P. McKay, chairman of the committee on aids to navigation of the Lake Carriers'- Association, is at present on board the lightship Kewaunee on the southeast shoal, Point au Pelee passage, Lake Erie, superintending the work of getting the boat in trim for the heavy work which it must perform between now and the close of navigation. Capt. McKay is enthusiastic over the lightship and says that no aid to navigation on the lakes has been of greater service. No vessel has struck the shoal since the lightship has been established there. Formerly groundings were frequent there. During the course of a conversation relative to the effectiveness of the new wrecking lighter Thomas F. Newman, which the Great Lakes Towing Co. had built by the Jenks Ship Building Co. at Port Huron, and which is now stationed at Windsor to work in connection with the wreckers Saginaw and Wales, Capt. McKay said that in his opinion a very few years more will see the end of the usefulness of wrecking lighters in the vicinity of Detroit. "The government is making such headway in providing wide and safe channels," said he, "in that part of the rivers which heretofore have been the cause of so many vessels coming to grief that there will not be any further need in a year or two for big wrecking outfits in this vicinity. Channels have been widened and deepened, buoys and ranges have been scattered so profusely and of such efficiency that they cannot be mistaken, and before long the Limekiln crossing and lower Detroit river, which have been the terror of masters ever since deep draught boats have been built, will no longer be feared. The straightening out of the cut channel from the lower end of Ballard's reef channel past the Limekiln crossing and down the Amherstburg reach will be of estimable benefit to lake shipping and will be worth to them all that the government has expended for the improvement."



Lake Superior Power Co.'s Power House under Construction.

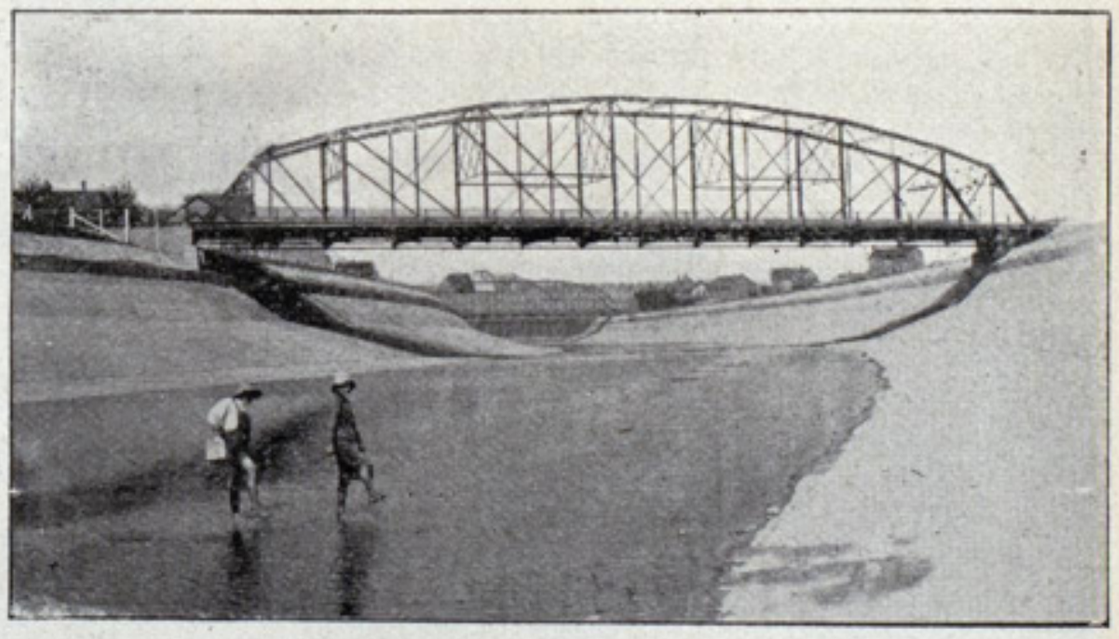
GREAT POWER CANAL AT THE SAULT.

The citizens of Sault Ste. Marie awakened the other morning to find the great canal, just completed, full of water. It had been filled during the night and thus the dream of years had been realized. Subsequently the water was permitted to run out. Its construction has represented an expenditure of $5,000,000, and it is regarded by engineers as the most magnificent work of its kind in the world. It is Francis H. Clergue's monument and is likely to be regarded as such for centuries. Like an immense river, 220 ft. broad and deep enough to float the biggest vessel that sails the lakes, it serves to convert Sault Ste. Marie into a city of two parts, with the island portion, now for the first time completely surrounded by water, as the business section, and the balance of the city given over to the homes of its citizens. In the future, when the Sault shall have achieved the greatness for which it is destined, it is altogether likely that every foot of the property inclosed in what is already becoming known as "the island," will be devoted exclusively to business purposes. The canal is 2 1-3 miles long from the mouth of the intake above the rapids to the outflow far below the entrance to the ship canals. The average width is 224 ft., and the depth is 22 ft. The intake has an area of more than 15,000 sq. ft., through which will flow a volume of water estimated at 30,000 cu. ft. per second, with a velocity of about 2 ft. per second or about 1½ miles per hour. The entrance is 891 ft. wide and 18 ft. deep. In its excavation some 300,000 cu. yds. of solid sandstone were removed.

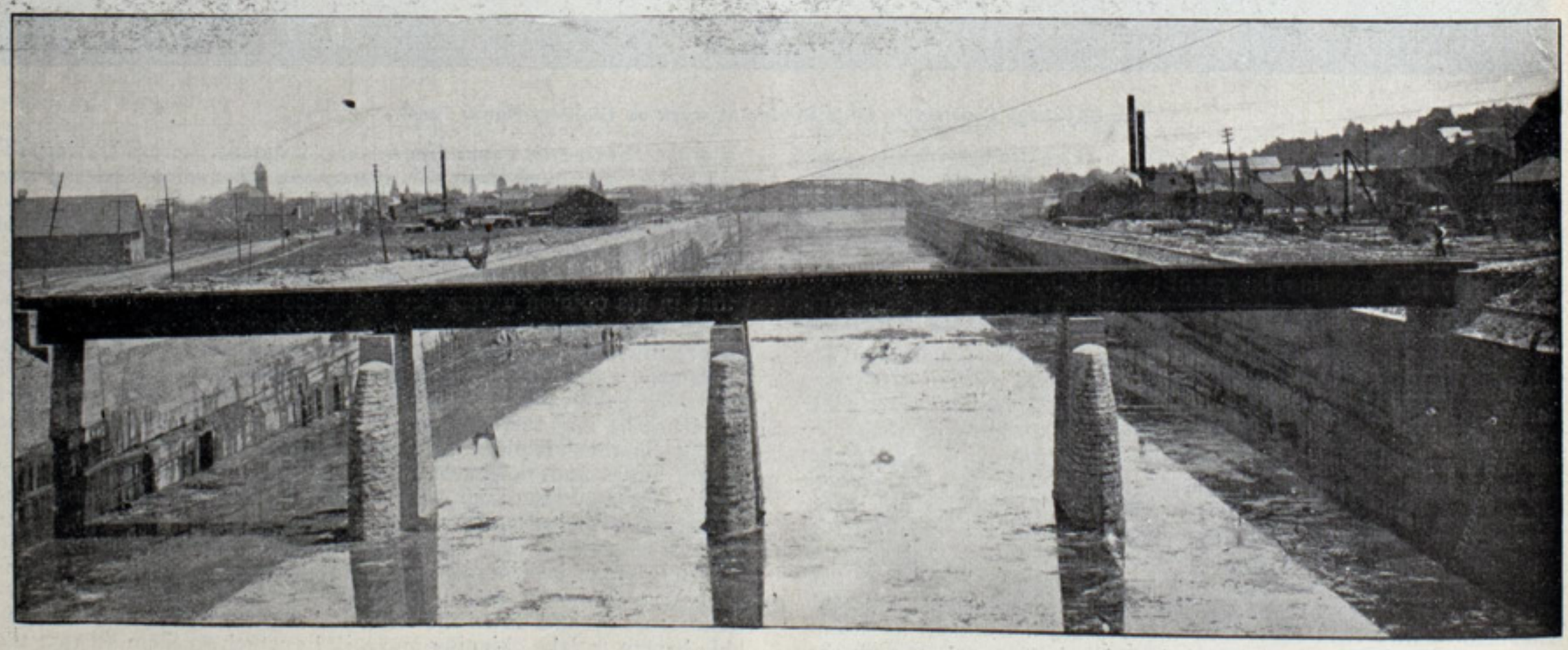


The Power House and Ice Rack.

At a point about 1,000 ft. east of the entrance the intake merges into the canal proper, the dimensions of which are outlined above. A cross section of the canal at this point measures 4,425 sq. ft. For a distance of 4,100 ft. from this point the solid rock formation continues. In cutting out the channel through this rock formation the sides were first cut out by channeling machines; the rock was then drilled, blasted and excavated



Typical planked section of the Canal.



Completed section of the Canal in Rock showing Railroad bridge.

and the sides wherever rough were smoothed off with Portland cement. The bed was similarly finished. The immense labor necessary to accomplish this can scarcely be comprehended. The appearance of the canal bed is as smooth as the exterior of a stone building.

The river front of the fore bay is closed by the power house, the duplicate of which cannot be found in the United States. It is constructed of red sandstone, is 48 ft. over a quarter of a mile in length, is 100 ft. wide and 125 ft. high. The massive building rests upon a foundation of piles covered by log sills and caps, and covered with Portland cement concrete to a depth of three feet. The cost of building this foundation alone represents a snug little fortune. The sub-structure consists of eighty-one masonry walls, 100 ft. long, 20 ft. high and 3 ft. thick. The stalls or pits thus formed, aside from supporting the building, serves to deliver the water from the turbines into the river. The superstructure of the power-house consists of eighty penstocks or turbine chambers and one spillway to carry off the logs, ice and other refuse, and the balance of the building is taken up by dynamo and mill floors.

SHIP BUILDING AND OTHER AFFAIRS AT BUFFALO

Buffalo, Sept. 9.—To build or not to built appears to be the problem of the shipyards on Buffalo creek, and it is likely that some sort of an arrangement will be reached before long, especially as the tugmen have gone back to work and the old sores are being cured one after another. The tugmen go back just as they went out, so far as this port is concerned, so they have very little to show for an idle summer. As to the ship carpenters the thread of the connection is completely lost. When they went out, about four weeks ago, it was supposed that it was to hold up the tug strike, but now there is doubt about it, and the most curious part of it all is that the labor leaders do not agree over the question as to who gave the order and why. Two men are disputing over the point, each apparently willing that the other should take the responsibility. The dry dock management has given the problem up and has been unable to find anybody to deal with on the subject and is now engaged in sitting on a pile, figuratively speaking, till somebody says that the men can go to work again.

In the meantime thousands of dollars have been allowed to slip out of the harbor on account of the lack of a dry dock to do business in and more will have to go. Still it is plain that the authorities look on the problem as not so very hard to solve, when once the right man comes to the top and it is likely that there will be ship building here this winter after all. There will be some very foolish people here if the present deadlock lasts.

A trip along the water front finds very little building in progress outside of scows and sand boats, though the re-organized Empire Ship Building Co. at the foot of Genesee street now has its new iron shop about completed, and will be ready to lay down the first of a line of steel tugs as soon as the material arrives. As it has been ordered two months it ought to be here before long. The company expects to have a force of 300 to 400 men at work during the winter. This company has no large dry dock yet, but has arranged to build one that will connect two small artificial islands in the basin in front of the yard, but this will not be done till spring. The plan is to build one 500 ft. long, as no dock is a complete one short of this length now. In effecting the re-organization the former interests were fully recognized, John Bateman being made president; James McDougall, vice-president; A. B. M. Palmer, secretary and John S. Watterson, treasurer. The interest of J. C. Gilchrist, which is understood to be large, does not appear on the cards of the company. After the line of tugs is finished the company will go into ordinary steel ship building, maintaining itself independent of any of the existing combinations in the ship building business.

Everybody is glad, of course, to find that the elevator war is over, and that there is promise of peace from this time on for an indefinite period. It does not look as though there would be any more elevators built here right away, for there is no need of more elevators, and as the earnings are now quite moderate nobody will want to build them to unload on the pool, as used to be the way of doing things. The small ones, floaters and canal houses generally are disappearing. One burns up occasionally and others are sold for old junk and torn down. Two are in that stage now and there are rumors of others to follow. Meanwhile the actual capacity of the port is improving every year, and the cost of handling and maintaining grain here is less than it used to be.

The canal meeting on 'Change Monday was a good thing, thought it turned out, as it too often does, that so many people depended on some one else to turn out that the attendance was only moderate. The object of the meeting was to impress on the political parties of the state that they must take up the canal or it would be taken up in spite of them, and they would be the losers for declining to unite business with politics. It was significant that the speakers, from Chairman Clinton down, took no pains to refer to the demand of the grain interests in an enlarged canal, but all spoke of the iron interest instead. This is wise, for the growing iron interest is local, while the grain interests extends to the Dakotas and the narrow-minded citizen is always prepared to refuse aid to any enterprise that promised to benefit others besides himself.

JOHN CHAMBERLAIN.

THE C. O. BARTLETT & SNOW CO.

A firm which has made enviable strides during the past few years is that of the C. O. Bartlett & Snow Co. of Cleveland. Nothing is more gratifying to ambition than success. About fifteen years ago Mr. C. O. Bartlett, who established the company, found himself, through no fault of his own, not only without a dollar in the world but with $2,000 of debts. An inventory of his assets showed that he had only an unimpeachable character left. By virtue of it he found that his credit was good. He added to his debts by borrowing sufficient money to secure the rental of a little shop, 6 by 12 ft., and enough tools to start the business of dressing mill stones. He had been in the oatmeal business and he knew how to dress mill stones and make mill machinery. In a little while, say three or four months, he got a contract to furnish the machinery for a mill and he made $1,000 by the deal. He diminished his indebtedness by that amount. An itinerant photographer came along and took a photograph of Mr. Bartlett and his little shop which is reproduced herewith. That was the beginning. Little by little it grew, holding what it got and expanding gradually. The little shop eventually got too small and Mr. Bartlett moved to Center street and added other features to his business. He was a natural mechanic. This spring the shop on Center street got too small also and Mr. Bartlett moved again. This time he moved onto his own property. He bought the entire block bounded by French, German, Winter and Fall streets on the flats and comprising about two acres of land, as a site for his new plant. The new manufacturing plant consists of two large three-story buildings with two elevators; a building for structural iron and boiler work; and another building for manufacturing and dressing Buhr stones, besides an abundance of

yard room for handling heavy dryers, tanks, boilers and engines. The buildings are fitted up with improved machinery, including Ingersoll-Sergeant compressors, pneumatic tools supplied by the Cleveland Pneumatic Tool Co. and a great variety of other machine tools. A portable oil rivet forge, manufactured by the Rockwell Engineering Co. of New York, has been installed for heating rivets. A railway switch penetrates the yard so that direct connection is had with all railways. The company makes mill machinery of various kinds and has been quite successful latterly in designing and building conveying machinery for the purpose of fueling steamers. The company will within the next two or three weeks install in its own plant a coal dryer of its own make. The purpose of the dryer is to dry coal and then crush it to a fine powder. It is fed to the furnaces by a Rowe feeder as coal dust mixed with hot air. Mr. Bartlett contends that drying and crushing the coal saves 30 per cent. of its fuel value and, owing to its perfect combustion no smoke whatever is made, and very little ashes. The cost of drying and crushing the coal is 10 per cent. of its total cost, so that according to his figures the net gain is 20 per cent. His argument is that there must always be smoke with imperfect combustion and that there will always be imperfect combustion when coal of varying size is fed to the furnace. The same degree of combustion cannot be obtained from a lump of coal as big as a pea and a lump as big as one's hand. If fed as powder, however, the combustion is even and thorough. Mr. Bartlett is confident that he can abate the smoke nuisance in Cleveland. The company is now installing dryers at the works of the McCormack Harvester Co. Chicago, and the South Western Portland Cement Co., Wilton, Ark. Mr. Bartlett's company was reorganized on July 1 last as the C. O. Bartlett & Snow Co.

The tug strike can now be said to be effectually over. The tugs of the Great Lakes Towing Co. are in operation at all of the ports though some difficulty was experienced at first in getting the tugmen at some of the ports to return to work. The objections of these few were removed, however, when the men who had been working on the tugs in commission during the summer voluntarily resigned.

LAKE SUPERIOR FREIGHT MOVEMENT IS IMMENSE.

The commerce of the Sault Ste. Marie canals is a never ending wonder because nowhere else in the world is there such a measure of traffic. The wonderful thing about it is the rapidity with which it was developed. The traffic through the canals during July and August of the present year is practically equal to the entire traffic for the year 1893. The figures are: July, 1902, 5,082,398 tons; August, 1902, 5,070,491 tons, a total of 10,152,889 tons; total for year 1893, 10,796,572 tons. To state it in another way the traffic for August of the present year is more than five times as great as the traffic of a full season twenty years ago, for twenty years ago the total commerce of the canals did not reach 1,000,000 tons. The total movement to Sept. 1 of the present year is 21,693,390 tons (net) as against 16,236,009 tons to Sept. 1, 1901 and 16,490,020 to Sept. 1, 1900. The traffic for this season to Sept. 1 is 5,403,381 tons greater than that of last year for the same period. The traffic for the entire season last year was 28,403,065 tons, so that should there be no increase for the balance of the season over that of last year the present year's traffic would reach 33,800,000 tons. It is expected that it will crowd, if not pass, the thirty-five million mark. Details of the traffic to Sept. 1 will be found in the following table:

Movement of Principal Items of Freight to and From Lake Superior.

ITEMS.	To Sept. 1, 1902.	To Sept. 1, 1901.	To Sept. 1, 1900.
Coal, anthracite, net tons	107,608	389,036	376,836
Coal, bituminous, net tons	2,878,659	2,301,981	2,702,959
Iron ore, net tons	15,285,652	10,956,954	10,818,663
Wheat, bushels	32,468,090	15,695,526	27,005,111
Flour, barrels	4,714,970	4,045,491	3,301,858

Report of Freight and Passenger Traffic to and From Lake Superior, From Opening of Navigation to September 1, of Each Year for Three Years Past.

EAST BOUND.

ITEMS.	Designation.	To Sept. 1, 1902.	To Sept. 1, 1901.	To Sept. 1, 1900.
Copper	Net tons	66,560	50,823	77,198
Grain, other than wheat	Bushels	4,214,480	7,671,110	5,824,151
Building Stone	Net tons	23,132	23,859	19,131
Flour	Barrels	4,714,835	4,045,311	3,301,696
Iron ore	Net tons	15,285,652	10,956,954	10,818,663
Iron, pig	Net tons	9,232	20,291	11,584
Lumber	M. ft. b. m.	672,565	606,304	488,133
Silver ore	Net tons			
Wheat	Bushels	32,468,090	15,695,526	27,005,111
Unclassified freight	Net tons	74,749	34,433	36,364
Passengers	Number	22,813	20,304	21,414

WEST BOUND.

Coal, anthracite	Net tons	107,608	389,036	376,836
Coal bituminous	Net tons	2,878,659	2,301,981	2,702,959
Flour	Barrels	135	180	162
Grain	Bushels	9,577	55,930	18,584
Manufactured iron	Net tons	93,126	69,691	79,637
Salt	Barrels	295,853	271,438	176,734
Unclassified freight	Net tons	352,897	277,090	247,624
Passengers	Number	22,723	22,167	22,529

Summary of Total Freight Movement in Tons

	To Sept, 1, 1902.	To Sept. 1, 1901.	To Sept. 1, 1900.
West bound freight of all kinds, net tons	3,476,102	3,079,734	3,433,946
East bound freight of all kinds, net tons	18,163,288	13,156,275	13,056,074
	21,639,390	16,236,009	16,490,020

	Vessel passages.	Registered tons.
To Sept. 1, 1902	14,226	19,382,359
To Sept. 1, 1901	11,742	14,141,814
To Sept. 1, 1900	12,337	14,319,248

AT THE HEAD OF THE LAKES.

Duluth, Sept. 8.—Weiland Bros. of Duluth, who have bought the sunken whaleback steamer Thomas Wilson, have commenced work on raising the ship by gathering material and supplies for the work. They do not anticipate any very serious job in getting the ship afloat and into the harbor. Indeed they do not think they will have as big a job with the Wilson as the Pittsburg Steamship Co. had with the Hadley. Conditions with the two ships are quite different. The Wielands will secure two barges, probably whalebacks, and will throw around them wire cable loops passed under and around the Wilson. The barges will be sunk as deep as possible, the cables clamped and then the water cargoes of the barges will be pumped out. If every thing goes as expected the Wilson must lift, provided the barges are of sufficient buoyancy. Three lifts should be sufficient to float the sunken steamer, buoyed up by her consorts, into the harbor, when it will be easy to get into the dry dock. It was proposed by them to pass the cables under the ship by means of a water jet, but now they figure they can do this with a couple of tugs, one at each end of a long cable, that will drop under the bow of the whaleback and will be sawed back and forth across the ship, thus making its way aft on the bottom of the lake. When this cable reaches points where cables for lifting should be placed these will be attached to it and drawn into position. The weight of the Wilson and cargo is about 4,500 tons and the depth of water in which she lies is 70 ft. The Wielands propose not only to lift the ship as above outlined but the cargo of ore as well. The Wielands have had no wrecking experience.

Freights are slightly higher to Buffalo and other ports, but it is doubtful if the market is as strong as a week ago. This is on account of the unexpectedly small crop movement up to date. The Buffalo wheat rate is now 2 cents on September contracts, while to Montreal or Quebec 5½ cents has been taken. For immediate delivery neither figure would be secured. Wheat is coming in very slowly, but far larger receipts are looked for in the immediate future. Orders for the sale of "to arrive" wheat indicate a good movement within the next week.

The report is that the Great Northern road has secured a contract with Minneapolis millers under which they are turning over to it a very large share of their eastbound flour, at 1 1-3 cents under the rate. This is given in the northwest as the reason for the chartering of eight outside ships by the Northern Steamship Co. It is really more likely that this chartering is in part at least, due to the unexpected delay of westbound Northern company freights. The line has been bringing up a very large quantity of rails from Conneaut and other points and this has held the boats back. Then there has been a tremendous increase in eastbound traffic in shingles and other far western products and these have necessitated additional facilities. But several of the chartered ships are not suited for either shingles or flour.

In the crop year ending with Sept. 1, 1902, the mills of Duluth-Superior have ground more flour than for a number of years, amounting to 1,568,000 bbls., and compared with 478,000 bbls., the year before and with 749,000 bbls., the second year preceding. Their exports have similarly increased, being respectively 800,000 bbls.. 187,000 bbls. and 280,000 bbls., in the three years in consideration. Another mill is now starting up that will add 50,000 bbls. monthly to the production.

At the yards of the Superior Ship Building Co., West Superior, the steel vessels Madeira, Roebling, Van Hise, and a whaleback barge arrived within an hour Friday, for repairs. On the Madeira thirty-four plates are to be replaced, while the others have lesser work in prospect. A hundred additional men were put at work.

Total lumber shipments by lake from Duluth-Superior and Two Harbors for August were 66,000,000 ft., of which 47,000,000 were from Duluth, 12,000,000 from Superior and 7,000,000 from Two Harbors. There were also shipped 5,000 tons of Pacific shingles and 2,500,000 local shingles, and 3,000,000 lath.

The government will put up a storehouse for cement preliminary to the construction of a $1,000,000 concrete pier system for the Superior entry. Work on the great structure will commence next spring if Portland cement is not altogether too scarce.

Wheat stocks increased in Duluth-Superior elevators about 200,000 bus. last week, making a total now of 550,000 bus. Coarse grains are coming in rather freely. A million bushels receipts is the estimate for the coming week.

PROBABLY TWENTY-FIVE MILLION TONS

An output of 25,000,000 gross tons of iron ore from the mines of the Lake Superior region this year, as against 20,589,237 tons in 1901, is entirely within the possibilities. When the present season of navigation opened 24,000,000 tons was regarded as an extreme estimate, but the demand in all lines of iron and steel manufacture has been so great that the big concerns controlling the mines have been operating them to their fullest capacity, irrespective of the constant congestion of ships at unloading docks, in which the steel interests have suffered even more than the individual vessel owners on account of delays to the vessels.

On the first of the present month the output of the mines was 17,051,530 gross tons, compared with 12,263,436 tons on the same date a year ago—a gain of 4,788,094 tons thus far in the season. August shipments this year footed up 4,078,311 tons, as against 3,602,005 tons for August of last year. Of course it is not expected that the output for the balance of the season will be on a basis of 4,000,000 tons monthly, but even with this rate of shipment very materially cut down, the twenty-five million mark may be reached, especially as a large number of vessels are tied up by contract to carry ore through November, and as the all-rail shipments are to be included in the year's total.

Mr. Walter E. Campbell, writing to the Review regarding the new steamer Columbia of the Detroit, Belle Isle & Windsor Ferry Co., says that she has proved herself to be very speedy. She is of steel throughout and has four decks. Her length is 216 ft., beam on the water line 45 ft., beam over all 60 ft., depth 19 ft. and draught 11 ft. Her engines are triple-expansion with cylinders 21½, 34 and 54 in. in diameter with stroke of 36 in. Steam is supplied by two Scotch boilers 13 ft. 3 in. in diameter and 13 ft. long, allowed 180 lbs. pressure. She is permitted to carry 3,200 passengers. She runs on the Detroit and Bois Blanc park route and Mr. Campbell is proud of her. She was designed by Mr. Frank E. Kirby.

The steamer Stephen C. Hall, with a cargo of lumber, while trying to make a dock at Sandusky this week, struck the Big Four dock and was so badly damaged that she sank almost immediately thereafter. It is claimed that her steering gear did not work properly. The Hall is owned by S. W. Gilchrist of Alpena.

THE REMARKABLE FAMILY OF WARD.

Probably the most extraordinary family that has ever exploited the natural resources of the great lake states was the Ward family, who literally wrested fabulous fortunes from Michigan when money was a great deal scarcer than it is to-day. Probably no single family ever had a greater genius for the practical affairs of life. Deficient in education they were masterful in native resource and were brilliant business men. The last member of this extraordinary family—that is the last who was part and parcel of the original group—is Capt. Eber Ward who is now living in Detroit. His uncle was old Sam Ward and his cousins were Eber B. and David Ward. Discussing them lately in Detroit Capt. Ward said:

"My uncle Sam could scarcely write his name; E. B., my cousin, could do only a little better; David was the only one who had anything like an education. The Ward brains came from Mrs. David Ward, born Prey, my grandmother, the wife of a Baptist minister, at Rutland, Vt. From what I know of her, it is my opinion that it was her superior qualities that made her descendants of the elder generation, such remarkable men and women. Of course there were exceptions, but on the whole the Wards were endowed for great achievements, ambitious, hard-working, gifted with singular foresight and acumen along the practical side of life. I make one exception, my own career, which has been of no special interest to anyone except myself," pursued the old gentlemen, modestly and with a most serious face. "But the elder Wards could pick up a living almost anywhere. That was one of their great peculiarities. All the boys knew how to get along.

"My father lived for twelve long, dreary years in the Adirondack mountains on a farm where almost anyone except a Ward would have starved to death. It was rocky soil, hardly fit to raise anything except mountain shrubs; yet he managed to make it pay him and besides raised a family of ten children, six girls and four boys. Three girls are alive yet, one ninety, one eighty-five, and one seventy. You may ask, 'Why didn't he get out, move off, to fine government land, in the west?' Well, my boy, in 1820, this whole country, aside from a narrow strip along the sea coast, was a vast wilderness. Remember, the first railroad wasn't built till 1828, and as for newspapers and other means of intelligence, they were exceedingly costly and had practically no circulation beyond the cities. Really, my father didn't know about Michigan, that's the plain truth of the matter. However, in 1837, he decided to come west. It was a lucky day for him when he left Keys township, Essex county, on the Au Sable, in the Adirondacks, a region still visited for its rugged grandeur. On our journey west, on the Erie canal, at Auburn, I fell overboard. I was only four years old and was nearly drowned; in fact, went down twice. After nearly seventy-five years this childhood's episode is still vividly impressed on my memory. We went from Buffalo to Chautauqua on the Peacock, a tiny steamboat of no account to-day, but thought one of the wonders of the world in '37. From Erie, we came to Detroit on the North America, a small side-wheeler. Our destination was Marine City, called then Newport; but soon I came to Detroit where I've lived for nigh on to sixty years.

"After I first drifted into steamboating as clerk, at $10 a month, on the little steamer Port Huron, which ran from Detroit to Port Huron, up one day and down the next. I was always identified with the transportation business, sometimes as owner, again as manager; but never sailed enough to make any pretense. The Ward line was regarded, in its day, as the most important transportation line of the lakes. I built the Keweenaw, which was 300 ft. long, the Saginaw, the Minneapolis, the Colbourne, and others. My first steamers had low pressure beam engines, the others were propellers. There were no propellers, you know, till 1850. The first was the Vandalia, and when she passed, at 6 miles an hour, people stood on the wharf, spellbound, to see her go by. The next were the Oswego, Chicago, Sampson and Hercules. Those were the days of individual ownership; and, in my opinion, after the trusts are done, we'll return to this way of doing business. I think, too, that the limit of size has been reached, and that dimensions will go down again. The 500-footers are really too long for the curves in the rivers, take too much dock room, too long to load and unload, and all that.

"For more than a quarter of a century I managed the Ward line and saw the Lake Superior trade grow to gigantic proportions and enrich Detroit. Gradually, too, I saw it fade from our city and, so far as I know, we have never regained that trade. Many have been the explanations of this condition, but to my mind it came about in a very simple way. After the panic of 1873, Detroit merchants were poor. The upper peninsula traders asked for long credit. We couldn't give it to them; Chicago was willing to carry them, and did so, obtained the trade, and has managed to hold it ever since.

"The year 1846 was made memorable in vessel interests by the appearance of the first shipment of copper in Michigan. I was on the Independence, the boat that brought it down from the Cliff mine, on Eagle river. John Chipman and I were up north taking a trip. The Independence shipped ten barrels of ore at the Cliff mine, for Pittsburg, where it was smelted. This was really the beginning of the great smelting business in Springwells, near Detroit. In 1852, I also saw the first iron brought down from the upper country. It came on the Atlantic, one of Cousin Eber's boats. At Marquette we shipped a quantity of iron slabs. The ore had been smelted near the mine. It took years to discover that it was more economical to smelt in the coal country. I next ran the Turk in Lake Superior, where there were nine or ten small sailing craft built about the rapids. You can say they were about 100 tons each. One day, I was at the Sault. It was a small place then of only 500 inhabitants, among whom were many Indians, but great excitement prevailed. One of the schooners was actually to run the rapids! It was regarded as an utterly foolhardy voyage, almost certain to result in the destruction of the vessel and the death of all on board. At the appointed time the banks were lined with people, all expressing their misgivings. Even the Indians, who were accustomed to shoot the rapids, in their canoes, shook their heads and said it was bad, bad. By and by, alone came the doomed schooner, all canvas set, a stiff gale carrying her straight into the rapids. The moment she struck her sails backed, she shivered from stem to stern and some of her rigging fell with a terrific crash. Then, she dashed forward, racing like mad through the wild, swift water, down for over a mile—and strange as it may seem, escaped without a scratch. She sailed to Detroit, where she put in many seasons in trade before she finally went to the boneyard.

"I see by the papers that the new trip to Buffalo is regarded as fast, and so it is, but bless you, old captains made the run forty years ago in excellent time. The chart says, if I remember rightly that the distance from Detroit to Buffalo is 256 miles, which the new boats make in fourteen hours, or a little less. But forty years ago there was a record-breaker at nearly that speed from Cleveland to Buffalo, which is counted 180 miles. Well do I remember the hot rivalry between the Empire State, which ran from Cleveland to Chicago, and my cousin's boat, the Ocean, from Detroit to Buffalo. The start was made amidst great excitement. Each steamer was stripped of every possible ounce of extra weight and no passengers, except a few friends, were allowed on board. Capt. Ward even had sailors with mops down in the hold, mopping out the bilge water in the space between the timbers and the bottom planks. Possibly there may have been a ton of bilge there. At any rate, the Ocean won, and for years afterward enjoyed the glory of being the fastest boat on the great lakes. Her time was ten hours and fifty-five minutes, which is not much less than the fastest time of the new boats to-day. The Ocean was finally cut down into a tow barge, and now has long been in the boneyard."

TO EXTEND GAS LIGHT SERVICE.

Officials of the Lake Carriers' Association have been endeavoring for some time past to have the United States lighthouse institution provide means for maintaining lights at certain isolated points on Lake Superior after the light keepers have left for the season. Vessels are often in commission two to four weeks after the lights have been given up for the winter. The light keepers are, of course, forced to leave some time before the vessels have all tied up for the season, as they have difficulty in getting ashore after the fall gales set in and can not take the chance of being confined in the lighthouses all winter. The lighthouse board is acting upon the request of the vessel owners, but it is not now probable that the plans under way will be carried out until next year.

Before putting in operation the scheme of providing tanks at the lighthouses, so that Pintsch gas may be left burning for some time after the keepers have gone, the lighthouse inspector at Detroit, who is in charge of the Lake Superior district, proposes an experiment on this score at the Windmill point station, just above Detroit. Col. Wm. St. John, representing the Safety Car Heating & Lighting Co. of New York, which controls the Pintsch patents, spent several days on the lakes recently with the district officials of the lighthouse service, and will render all necessary assistance in the experiment. It will be necessary also, if the gas buoy service so popular on the lakes is to be extended as it should be on the St. Mary's river and in Georgian bay, to establish a plant for the manufacture of gas at Sugar island on the St. Mary's river. Col. St. John has had this matter under consideration with the lighthouse board and it is expected that something will be done shortly. Canadian government officials are trying to provide means for the establishment and maintenance of quite a large number of gas buoys in the Georgian bay district, and it is suggested that gas for the buoys made at the proposed plant at Sugar island could be sold to the Canadian department in charge of this work.

The captains of the steamer Maine and schooner Jackson, hailing from Sarnia, got themselves into trouble at Cleveland last Saturday. The boats arrived Saturday afternoon with about 1,000,000 ft. of lumber on board. Without waiting to make an entry they began to unload the lumber. Collector of Customs Leach heard of what they were doing and put a stop to the proceedings. Mr. Leach put a keeper in charge of the boats to prevent further attempt to unload until an entry was made of the stock.

AROUND THE GREAT LAKES.

The directors of the Suez canal have decided to reduce the rate for transit through the canal after Jan. 1 next 5 centimes per ton.

Capt. C. T. Morley, the veteran ship builder and owner of Marine City, died this week. He had long been prominent in marine affairs.

The tug Robert Palmer was launched at the Palmer ship yard, Noank, Conn., last week. The tug is 100 ft. long, 14 ft. wide and 10 ft. deep.

The old tug Witch of the Water, a description of which was lately given in the Review, was condemned by the United States inspectors on June 24, 1902.

In crossing Lake Huron in heavy weather last week the propellor John Craig sprung a leak. She was entered at the upper dry dock at Detroit for repairs.

Francis L. McDonald, Duluth, Minn., was the lowest bidder for connecting Presque isle breakwater with the shore at Marquette, Mich. His bid was $5,534.90.

The steamer H. Houghton sank at her dock at Detroit early on Tuesday morning. Two boys who were in her were drowned. She had just arrived from Kelley's island with a load of crushed stone.

The International Longshoremen, Marine & Transport Workers' association now has 384 local organizations under its jurisdiction. Of these twenty-two have been affiliated since the Chicago convention in July.

An ore storage trestle with a capacity of 175,000 tons is in course of construction at Erie by the Pennsylvania railway. C. A. Sims & Co. of Philadelphia, have the contract and 300 men are rushing the work along. The trestle is 1,400 ft. long.

The Lake Erie Dredging Co., which is now operating the Hingston & Woods plant, has begun work on the improvement of the Niagara river channel to Tonawanda, the contract involving a cost of $250,000. This will allow heavily laden lumber boats to make the Niagara river port.

The little passenger steamer I. M. Weston, which has been engaged in carrying excursions down the drainage canal to Lockport for several years caught fire last week and was burned to the water's edge. She was formerly in the fruit and passenger trade on Lake Michigan.

The marine branch of the Detroit postoffice reports that 44,351 pieces of mail matter were delivered to vessels passing the city during the month of August, and 16,456 received from the same. During the month 3,198 vessels passed and forty-seven money orders were issued to the crews, aggregating $690.40.

The incorporation of the Canadian Lake & Ocean Navigation Co., with a capital of $3,000,000, is announced from Ottawa. The company proposes to engage in the business of a ship building, engineering, navigation, transportation and terminals company, to deal in cereals and manufacture cereal products, to carry on an elevator and storage business and other enterprises.

The steamer William H. Stevens of Buffalo, loaded with copper and flour, bound from Duluth to Buffalo, was burned to the water's edge off Clear creek on Monday night. The vessel was valued at about $50,000 and the cargo at considerably more. The Stevens was owned by the Union Transit Co. and was built in 1886.

A long distance telephone is to be run from Grand Marias to Whitefish point, Lake Superior, and will furnish invaluable assistance to life savers in case of disaster. It will also be of service in the display of storm signals at Whitefish point by the weather bureau. Herman B. Conger of the weather bureau service at Detroit, who originated the service, expects to have it in operation by the middle of September.

A largely attended meeting of business men at Buffalo this week adopted resolutions favoring the enlargement of the Erie canal to a 1,000-ton barge capacity. It was also resolved that each candidate for assembly from Erie county, regardless of party, be asked to pledge himself not to vote for the election of any one for presiding officer of the assembly or senate who would not commit himself unqualifiedly to the policy of canal improvement as might be decided on by the great commercial and maunfacturing interests of the state.

The Lumber Carriers' Association has succeeded in taking into its fold thirty more vessels, or about 12,000 tons, nearly all being Lake Michigan craft. It is announced that owners of nearly all of the small number of boats still outside of the organization's ranks have made application for membership. Among the vessels to join the organization were the fleet of five steamers owned by Samuel Neff & Sons, Capt. Micjaelson's fleet of four boats and the two schooners, Ada Medora and Sophia J. Luff.

Vessel men in general svmpathize with Mr. John F. Wedow of the firm of Mitchell & Co. in his bereavement. His wife, who had been ill for some time died on Saturday last. Mrs. Wedow was born at Marine City, Mich., and was forty-four years of age. She had been a resident of Cleveland since she was fourteen years old. She had seven children, four sons and three daughters, all of whom are living. The funeral was held from the family residence No. 93 Tilden avenue on Tuesday afternoon.

Wrecker Capt. Harris W. Baker has returned to Detroit after an unsuccessful attempt to raise the sunken Bradley steamer City of Cleveland, which went down in Georgian bay last fall. Capt. Baker and the wrecking steamer Snook worked eighteen days, built cofferdams and were raising the boat when the rocks dropped out of her bottom and the wreck again went to the bottom of the bay. She is a total loss now and her cargo is not worth going after. The boat's decks are out and cabins gone, and sides spread out 4 ft.

Judge Hazel of Buffalo has rendered a decision in the admiralty action of George Stone et al., libelants against the steamer Yuma and the Wilson Transit Co. The action grew out of the loss of the schooner John Martin, which was sunk in a collision with the Yuma in the St. Clair river on Sept. 21, 1900. The action was tried before Judge Hazel in March last. Judge Hazel holds that the collision was due to concurrent negligence of both the crews of the Yuma and the Martin. He condemns both and directs that an order be entered for a division of the damages and for a reference to estimate the amount.

It is reported that the steamer James H. Hoyt of the Provident Steamship Co.'s fleet was unloaded at the docks of the Illinois Steel Co. at Chicago one day last week in four hours working time. In all 5,450 tons of ore were taken out of the steamer during that time. The work was done by the Mason & Hoover unloading machines though it is not as yet known how many machines were at work upon her. The Hoyt has nineteen hatches. This is the record for unloading so far. The Hoyt was unloaded a few weeks ago at Conneaut in five hours and twenty-three minutes.

While it was generally believed that the limit in size of cargo carriers on the lakes was reached when the John W. Gates, James J. Hill, Isaac L. Elwood and William Edenborn were built, it is now understood that preliminary plans have been prepared for a vessel that will be 52 ft. longer than these. The plans call for a steamer 550 ft. over all, 530 ft. keel, 56 ft. beam and 32 ft. deep, equipped with quadruple-expansion engines and Scotch boilers with forced draft. Her equipment throughout will be modern and she will be especially adapted for the rapid handling of ore. Beyond the announcement that plans of this character are under consideration nothing more definite is at present known.

The Pittsburg Steamship Co. which operates the lake fleet of vessels belonging to the United States Steel Corporation put a Chase automatic towing machine on the whaleback barge No. 137 last spring, has now followed it up with an order for eight others to be installed next winter. In this connection the following item from the Detroit Free Press is of interest: "As there has been considerable argument among steamboatmen as to which was the better puller among the wooden boats it has been settled between the Iosco, towing the Olive Jeanette, and the City of Berlin, with the Aurora in tow. They raced across Lake Huron, the Aurora having on board 3,400 tons and the Jeanette 1,888 tons. The Berlin beat the Iosco by forty-five minutes." The City of Berlin tows with the assistance of a Chase automatic towing machine, made by the Chase Machine Co. of Cleveland.

SHIP BUILDING AT PHILADELPHIA AND VICINITY.

Philadelphia, Pa., Sept. 8.—The Cramps made a new record last week when they hauled apart the two sections of the Clyde liner Araphoe in exactly eight minutes by the watch. The Araphoe is to be lengthened 52 ft. and the fore and aft sections, previously prepared for the operation by cutting of all rivets and connecting rods, were pulled apart for the required distance in the shortest time in which such a task has ever been accomplished in any ship yard. The Clyde line are having the Araphoe lengthened to meet the greatly increased demands of the service.

The names of the two gaint 13,370-ton steamers now being built for the Atlantic Transport Co. by the New York Ship Building Co. at their Camden yards, have just been announced as Minnekhada and Minnelora. These boats, each 600 ft. long, 65 ft. beam and 32 ft. 2 in. draught, will, when completed, be the largest craft ever turned out by a Delaware river ship yard. The New York company are also building the Mississippi and the Massachusetts for the same line. These are each to be of a gross tonnage of 8,100, length 490 ft., beam 58 ft. and 29 ft. 4 in. draught.

The Delaware River Ship & Engine Building Co. (Roach's old ship yard at Chester) has secured the contract for building two of the largest steamers ever built in the yards. Each is to be over 5,000 tons. One is for the Savannah line and the other for the Mallory line. The latter is to have two screws driven by two triple-expansion engines. The Delaware river company is also to build two oil steamers of 3,660 gross tonnage each for the J. M. Guffey Petroleum Co. These vessels are each to be 360 ft. long, 46 ft. 3 in. beam and 20 ft. draught. Shapes for two of these four new steamers are being manufactured by the Phoenix Iron Co., Phoenixville, Pa.

The giant liner Finland, at Cramps, is rapidly nearing completion. On the stocks at Cramps, besides the armored cruisers Pennsylvania and Colorado and the Ottoman cruiser Medijidia, are an oil tanker and a fast new passenger steamer for the Central railroad of New Jersey.

Brief History of Ocean Steamships.

BY LAWRENCE IRWELL.

There is a general impression that the first steamship to cross the Atlantic was the Savannah, which in 1819 made the voyage from the port of the same name to Liverpool in twenty-five days. The Savannah, however, was not a steamship and was under sail more than two-thirds of the way across. She was a full-rigged packet ship, and had on her deck a small steam-engine, by means of which motion was given to the craft in smooth water when the wind failed. The log is full of such entries as : "At 8 a. m. tacked to westward;" "took in the mizzen and foretop-gallant sails;" "got steam up and it came on to blow fresh;" "stopped wheels to clean the clinkers out of the furnace;" "started wheels;" and similar expressions which show that the Savannah was not a steamer in the proper sense of the term.

In 1838, the Sirius and the Great Western successfully made the journey from England to the United States; but five years before that date, Canadian enterprise accomplished the feat of bridging the Atlantic with a little vessel propelled by steam. This was the Royal William—named in honor of the reigning sovereign—which was built in the city of Quebec by a Scotchman, James Gondie, who had learned his business at Greenock, Scotland. The keel was laid in the fall of 1830, and her builder, then in his twenty-second year, wrote: "As I had the drawings and the form of the ship, at the time a novelty in construction, it devolved upon me to lay off and expand the draft to its full dimensions on the floor of the loft, where I made several alterations in the lines as improvements. The steamship being duly commenced, the work progressed rapidly, and in May following was duly launched, and before a large concourse of people was named the Royal William. She was then taken to Montreal to get her engines, and I there superintended the finishing of the cabins and deck-work. When completed she had her trial trip, which proved quite satisfactory. Being late in the season before being completed, she only made a few trips to Halifax." The launching of this steamer was a great event in Quebec. The governor-general and his wife were present, the latter christening the ship. Military bands supplied the music, and the shipping in the harbor was gay with bunting. The city itself wore a holiday look. The Royal William propelled by steam alone, traded between Quebec and Halifax. While at the last-named place, she attracted the attention of Mr. Samuel Cunard, the founder of the transatlantic line which bears his name. It has been said that the Royal William convinced him that steam was the coming power for ocean navigation. He asked many questions about her, took down the answers in a note book, and subsequently became a large stockholder in the ship.

The cholera epidemic of 1832 paralyzed business in Canada, and trade was at a stand-still for a time. Like other enterprises at this date, the Royal William experienced reverses and she was doomed to be sold at sheriff's sale. Some Quebec gentlemen bought her, and resolved to send her to England to be sold. In 1833 the eventful voyage to England was made successfully, and without accident of any kind. The proportions of the Royal William were as follows: Builders measurement, 1370 tons; steamboat measurement, according to Canadian act of parliament, 830 tons; length of keel, 146 ft.; length of deck from head to taffrail, 176 ft.; breadth of beam inside the paddle-boxes, 29 ft. 4 in.; outside paddle-boxes, 43 ft. 10 in.; depth of hold, 17 ft. 9 in. It may be well to contrast these dimensions with those of the White Star liner Cedric, launched at Belfast, Ireland, on Aug. 21 last, which are: Length, 700 ft.; breadth of beam 75 ft.; carrying capacity, 18,400 tons. Her tonnage has been given in the reports as 21,000 tons and she is said to have accommodation for 3,000 passengers.

On Aug. 4, 1833, the Royal William, commanded by Capt. John McDougall, left Quebec via Picton, N. S., for London, England, under steam, at 5 a. m. She made the passage in twenty-five days. Her supply of coal was somewhat over 330 tons (254 chaldrons). Her captain wrote: "She is justly entitled to be considered the first steamer that crossed the Atlantic by steam, having steamed the whole way." About the end of September 1833, the Royal William was sold for £10,000, and was chartered to the Portugese government to convey troops. Portugal was asked to buy her for the navy but the admiral of the fleet not thinking well of the scheme declined to entertain the proposition. Capt. McDougall was master of the steamer all this time. He returned with her to London and laid her up at Deptford. In July orders came to fit out the Royal William to run between Oporto and Lisbon. One trip was made between these ports and also a trip to Cadiz for specie for the Portugese government. On his return to Lisbon, Capt. McDougall was ordered to sell the steamer to the Spanish government, through Don Evanston Castor da Perez, then the Spanish ambassador to Portugal. The transaction was completed Sept. 10, 1834, when the Royal William became the Ysabel Segunda, and the first war steamer the Spaniards ever possessed. She was ordered to the north coast of Spain against Don Carlos. Capt. McDougall accepted the rank and pay of a commander and by a special proviso was guaranteed £600 per annum, and also the contract to provide the squadron with provisions from Lisbon. The Ysabel Segunda proceeded to the north coast, and about the latter part of 1834 she returned to Gravesend, to be delivered up to the British government to be converted into an up-to-date war vessel at the imperial dock yard. The crew and officers were transferred to the Royal Tar, chartered and armed as a war steamer, with six long 32-pounders, and named the Reyna Governadoza, the name intended for the City of Edinburgh, a steamer which had been chartered to form part of the squadron. When completed, she relieved the Royal Tar and took her place.

The Ysabel Segunda, when ready, took out General Alava, the Spanish ambassador, and General Evans and most of his staff officers, to Saint Andero, and afterwards to Saint Sebastian, having hoisted the commodore's pennant at St. Andero. She was afterwards employed in cruising between that port and Fuente Arabia, and acting in concert with the legion against Don Carlos until the time of service expired in 1837. She was then sent to Portsmouth, England, with part of the men discharged from naval service, and from there she was taken to London and detained in the city canal by Commodore Henry until the claims of the officers and crew on the Spanish government were settled, which was ultimately accomplished, and the officers and crew discharged from the Spanish service at the end of 1837. The ship was delivered up to the Spanish government without delay. After having her engines repaired, she was sent to Bordeaux, France, to have her hull overhauled. On being surveyed, however, it was found that her timbers were so much decayed that it was decided to build a new vessel to receive her engines. This was built at Bordeaux, and was added to the steam navy of Spain in 1853, her predecessor being converted into a hulk.

The foregoing is the history of the ship which played so important a part in the maritime annals of Canada, England and Spain. Her model may be seen in the rooms of the Historical Society of the city of Quebec. A copy of this model formed part of the Canadian exhibit at the World's Fair at Chicago.

EARLIEST STEAMERS OF THE WORLD.

The earliest steamers the world ever saw, not reckoning the experimental craft constructed by such men as Fulton, Bell, Symington and Watt were those employed in the trainsatlantic trade. The Savannah, although not a true steamship, as has already been explained, made the voyage from Savannah to Liverpool in twenty-five days, but the merit of her performance, as an illustration of the superiority of the engine over canvas, is of course, doubtful, as she was under sail during at least two-thirds of the trip. The credit of this voyage, however, belonged to the United States, and until about thirty-five years ago this country seemed to be ahead of all others, including Great Britain, in maritime matters. The famous Baltimore clippers gave a good lesson in ship building to European nations, and the superiority of American sailing yachts is almost universally recognized at the present day. It was not till twenty years after the voyage of the Savannah that the successful passage of two memorable vessels from England to the United States fairly established the era of what has been called the Atlantic steam ferry. These ships were respectively the Sirius and the Great Western. The former had engines of 320 H. P. She left Ireland April 4, 1838, under the command of Lieut. Roberts of the British Royal Navy, bound for New York. The latter ship was a steamer of 1340 tons, builders' measurement. She was commanded by Capt. Hoskins, R. N., and sailed from Bristol April 8 in the same year, also bound for New York. The Sirius, it was calculated, had a start of her competitor by about 700 nautical miles, but it was known that her utmost capabilities of speed scarcely exceeded 8 knots an hour. On her trial trip between Blackwall (London) and Gravesend, the Great Western made 11 knots an hour without difficulty. The result of the race was therefore, awaited with the utmost curiosity on both sides of the Atlantic. Contemporary records usually afford good evidence of the significance of past events, and the interest in this novel ocean journey was very great, to judge from the accounts with which the Liverpool and New York papers were filled. The following is in brief the narrative of the voyage of these two famous ships across the ocean:

The Sirius, after leaving Cork, encountered very heavy weather, which greatly retarded her progress. She arrived, however at Sandy Hook on the evening of Sunday April 22, but going aground, she did not get into the North river until the following morning. When it was known that she had arrived, New York became agitated with excitement.

"The news," said the account published by the Journal of Commerce (New York), "spread like wild-fire throughout the

city, and the river became literally dotted all over with boats conveying the curious to and from the stranger. There seemed to be a universal voice in congratulation and every visage was illuminated with delight. A tacit conviction seemed to pervade every bosom that a most doubtful problem had been most satisfactorily solved. Visions of future advantage to science, to commerce, to moral philosophy began to float before the 'mind's eye'. Curiosity to travel through the old country, and to inspect ancient institutions, began to stimulate the inquiring. While all this was going on, suddenly there was seen over Governor's island a dense black cloud of smoke spreading itself upward, and betokening another arrival. On it came with great rapidity, and about three o'clock in the afternoon its cause was made fully manifest to the accumulated multitudes at the Battery. It was the steamship Great Western, of about 1,600 tons burden (probably net tonnage) under the command of Lieut. Hoskins, R. N. She had left Bristol on the 8th inst., and on the 23rd was making her triumphant entry into the port of New York. This immense moving mass was propelled at a rapid rate through the waters of the Bay. She passed swiftly and gracefully round the Sirius, exchanging salutes with her, and then proceeded to her destined anchorage in the East river. If the public mind was stimulated by the arrival of the Sirius, is became almost intoxicated with delight upon view of the superb Great Western. The latter vessel was only fourteen clear days out, and neither vessel had sustained a damage worth mentioning, although both vessels had encountered very heavy weather. The Great Western averaged 186½ miles per day, and the Sirius 130½ miles. The Great Western averaged 7¾ miles per hour; the Sirius barely averaged 5½ miles per hour."

Such was the first voyage made across the Atlantic by these two early steamships, and there is something of the true philosophy of history to be found in the interest which their advent created. It is worthy of passing note to learn what ultimately became of these vessels. The Sirius, not proving staunch enough for the Atlantic service, was sent to open steamer communication between London and St. Petersburg (Russia), in which trade she was for several years successfully employed. The great Western made regular trips from Bristol to New York till the year 1847, when she was sold to the Royal Mail Co. and ran as one of their best ships till 1857, in which year she was broken up as being obsolete, and unable profitably to compete with the new class of steamers then building.

The success of these two vessels may be said to have completely established steam as a condition of the transatlantic voyage of the future. In October 1838, Sir John Tobin a merchant of Liverpool, seeing the importance of the intercourse so rapidly increasing between the old and the new worlds, despatched on his own account a steamer to New York. She was built at Liverpool and was named after that city. She made the voyage to the United States in sixteen and a half days. It was now clearly proved that the service could be performed not merely with profit to those who engaged in it, but with a regularity of speed with which the finest class of sailing vessels could not be expected to compete. "If any doubts still existed on these important points, the second voyage of the Great Western set them at rest, she having on this occasion accomplished the outward passage in fourteen days and sixteen hours, bringing with her the advices of the fastest American sailing ships which had sailed from New York long before her, and thus proving the necessity of having the mails conveyed by steamers."—(Lindsay, History of Merchant Shipping).

EARLY MAIL CONTRACTS.

As early as 1838 the British government, being satisfied of the superiority of steamers over sailing ships, issued advertisements inviting tenders for the conveyance of the American mails by the former class of vessels. The owners of the Great Western having great confidence in the reputation of that ship, applied for the contract, but, not a little to their chagrin it was awarded to Mr. Samuel Cunrad who, as far back as 1830, had proposed the establishment of a steam mail service across the Atlantic. The terms of the original contract were that for £55,000 per annum, Messrs. Cunard, Burns & MacIver should provide three ships, and make two voyages each month between Liverpool and the United States, leaving England at certain periods, but son afterwards it was considered more expedient to name fixed dates of departure on both sides of the ocean. Subsequently another ship was required to be added to the service, and the amount of the payment was increased to £81,000 per annum. The steam mail service betwen Liverpool, Halifax and Boston was regularly established in 1840, the first ship engaged in it being the Britannia, the pioneer ship of the Cunard line.

A good idea of what these early steamships were may be obtained from Dickens' account of this same Britannia, in which he crossed to the United States on his first visit in 1842. In one of his letters describing a storm by which the ship was overtaken, he unconsciously reflects the wondering regard with which the world still viewed the triumphant achievements of the marine engine. "For two or three hours," he wrote, "we gave it up as a lost thing. This was not the exaggerated apprehension of a landsman merely. The head engineer, who had been in one or the other of the Cunard vessels since they began running, had never seen such stress of weather; and I afterwards heard Capt. Hewitt say that nothing but a steamer, and one of great strength, could have kept her course and stood it out. A sailing-vessel must have beaten off, and driven where she would, while through all the fury of that gale they actually made 54 miles headlong through the tempest, straight on end, not varying their track in the least." What would the captain of one of the greyhounds of to-day think of such a feat? And, more interesting speculation still, what must Charles Dickens himself have thought of the performances he lived to witness as against this astonishing accomplishment on the part of the old Britannia? There is a tendency to ridicule the early steamers as they appear in pictures, with their great boxes for the side-wheels, their tall, thin smoke stacks and their heavily-rigged masts, which look as though their engines were regarded as quite auxiliary to their sail-power, and by no means to be relied upon, contrasted with some of the leviathans of the present time, the steamers of half a century ago are no longer calculated to please the beholder, but it is nevertheless true that some very fine vessels were built while the marine engine was still in its infancy. In 1839, the following account of a new steamship appeared in an English publication, the Railway Magazine.

"An immense steamer, upwards of 200 feet long, was lately launched at Bristol for plying between England and America; but the one now building at Carling & Co.'s Limehouse, for the American Steam Navigation Co. surpasses anything of the kind hitherto made. She is to be named after our Queen, the Victoria, will cost from £80,000 to £100,000, has about 150 men now employed daily upon her and is expected to be finished in November next. The extreme length is about 253 ft., but she is 237 ft. between the perpendiculars, 40½ ft. beam between the paddle-boxes, and 27 ft. 1 in. deep from the floor to the inner side of the spar deck. The engines are two, of 250 H. P. each, with 6 ft. 4 in. cylinders, and 7 ft. stroke. They are to be fitted with Hall's patent condensers in addition to the common ones. She displaces at 16 ft. 2,740 tons of water. Her computed tonnage is 1,800 tons. At the water line every additional inch displaces 18½ tons. The average speed is expected to be about 200 nautical miles per day and consumption of coal about 30 tons. The best Welsh coal is to be used. It is calculated she will make the outward passage to New York in eighteen days, and the homeward in twelve, consuming 540 tons of coal out and 360 home. Expectation is on tiptoe for the first voyage of this gigantic steamer alongside of which other steamers look like fishing boats."

The steamers of the East India Co. had made trips to the Cape of Good Hope nearly two years before the Sirius and Great Western sailed upon their first voyage.

The next route upon which regular steam navigation was opened, following upon that of the North Atlantic passage, was between Great Britain and India. The Nautical Magazine (English) for 1836, contains the original prospectus issued by a syndicate of London merchants upon the subject of steam communication with the East Indies. As an illustration of the almost incredible strides that have been made in ocean travel since that period, this piece of literature is most instructive. The circular opens by announcing that it is proposed to establish steam-traffic with India, extending, perhaps, even to Australia. It points out in sanguine terms how those distant parts of the world, by the contemplated arrangement, "will be reached at the outset in the short period of seventy-three days; and, when experience is obtained this time will in all probability be reduced by one-third. If two days be allowed for stoppages at stations, not averaging more than 1,000 miles apart throughout the line (route), the whole time for passing between the extreme points will only be sixty days, but a relay of vessels will follow, if the undertaking be matured, in which case twenty-four hours will be ample time at the depots, and a communication may be expected to be established and kept up throughout the year between England and Australia in fifty days. (The Australian city, Melborne, is 11,267 miles from London.) It is reasonably expected that Bombay will be reached in forty-eight days, Madras in fifty-five, Calcutta in fifty-nine, etc. * * *" Letters now arrive at Bombay seventeen days after leaving England and at Calcutta three days later.)

The writer in the Nautical Magazine gravely comments upon this scheme as quite plausible. He is indeed inclined to be anticipatory. Instead of seventy-three days to Australia, he is of opinion that the voyage may ultimately be accomplished in fifty, and that the table of time generally may be reduced by about one-third throughout; although to qualify his somewhat daring speculations, he admits that it is well to base the calculations on the safe side. But the East India Co. asserted its prerogatives and put a stop to the scheme of the New Bengal Steamship Co., as the undertaking was to have been called. This raised a strong feeling of dissatisfaction, and the court of directors of the former concern was obliged to provide a substitute in lieu of the new undertaking which they had refused to sanction. Their own ships were quite unequal to the requirements of "prompt despatch" which even then were beginning to agitate the minds of the somewhat conservative English people.

STEAM COMMUNICATION BETWEEN ENGLAND AND INDIA.

The possibility of establishing steam communication between England and India had been clearly demonstrated as early as the year 1825, when the Enterprise 480 tons and 120 H.P.

sailed from London, Aug. 16, and arrived in Calcutta Dec. 7. She was the first steamer to make the passage from England to India. It was not till the people of England began to petition, and the merchants of London to clamor for the adoption of steam-power in the Indian navigation that the magnates of the East India Co. were stimulated into action. The "overland route" (Brindisi (Italy), Suez Canal and Indian ocean) had almost entirely superseded the sea voyage by way of the Cape of Good Hope, but the want of an efficient steamer service between London and Alexandria (Egypt) and between Suez and Bombay was greatly felt. Accordingly in December, 1836, the steamship Atlanta was sent from England to run on the Indian side of the route. She was a ship of something less than 650 tons burden, with engines of 210 H. P. The orders to her commander when leaving Falmouth were that he was to steam the whole distance, and was only to resort to sail power in case of a failure of machinery, in order fully to test the superiority of the marine engine over canvas. She sustained an average speed of about 8 knots an hour during the whole voyage, and but for her repeated stoppages would undoubtedly have made a quick passage to India. She was followed during March, 1837, by the Bernice of 680 tons and 230 H. P. which also made the trip without the assistance of her sails. She left England March 17 and arrived at Bombay June 13. As the race between the Sirius and the Great Western may be said to have inaugurated the steam navigation of the Atlantic, so did the voyage of the Atlanta and the Bernice first establish regular communication by steamer between Great Britain and India. There had, it is true, been desultory efforts of enterprise prior to this time, and the pioneer of the Peninsula & Oriental steamers, the Royal Tar, had made a trip three years previously, but there had been no regular service. The London Times of Nov. 11, 1838, pointed out the approaching change.

"Scarcely has the wonder created in the world by the appearance of the Great Western and British Queen began to subside," says the editorial, "before we are again called upon to admire the rapid strides of enterprise by the notice of an iron steamship, the first of a line of steamers to ply between England and Calcutta, to be called the Queen of the East, 2,618 tons and 609 H. P. When the vessels are ready, we understand the voyage between Falmouth and Calcutta will be made in 30 days."

From this time, ocean steamers began to multiply somewhat rapidly. One after another of the now famous shipping firms sprang up, beginning with the Cunard line in 1840. The first British steamship was registered at London in 1814; in 1842 there were 940 steamers registered; and the decay of the merchant sailing vessel was anticipated to such an extent that, in 1843, a member of the British house of commons drew attention to the fact that the introduction of steamers and the displacement of smacks and other sailing vessels "would diminish the nursery for seamen."

A LONG PROCESS OF DEVELOPMENT.

The steamship of the present day is the result of a long process of development extending over about 100 years. Miller's experiments on a Scotch lake in 1788; Symington's Charlotte Dundas, which steamed on the Forth and Clyde canal (Scotland) 1802; Fulton's Claremont on the Hudson in 1807; and Bell's Comet on the Clyde in 1812—these were the beginnings of this wonderful system of marine propulsion. At first steamers only traded on inland waters and coasting routes, but the traffic became gradually extended further seawards, until the Atlantic was crossed, as has already been described in detail. The hulls of steamships were at first of wood, followed about 1840 by iron, and about 1878 steel became the material used in construction. During this long period the form of the hull has undergone changes, chiefly to suit the system of propulsion adopted, and with the object of having as little resistance to the passage through the water as possible. Double hulls have been tried, but have not proved satisfactory, as the increased skin-resistance lessens the speed. Some curious devices have been tried to reduce this element of resistance, for example, cigar-shaped boats with inclined lower surfaces (the idea being that at high speed the ship would rise and skim along the water), and quite recently drums or rollers were used as a substitute for the ordinary hull, the rotation of the rollers being expected to do away with the frictional resistance of the passing water.

The engine and boiler have undergone many more changes than we have seen in the hull. On transatlantic and transpacific steamers, side-wheels have almost entirely disappeared, having been superseded by propellers. As the power of the engine is required to produce rotation on the shaft of the propeller, there is large scope for invention in the design, and as a result we have had beam engines, side-lever engines, steeple engines, and engines of a direct action placed horizontally, diagonally, or vertically as in screw-propelling machinery. Oscillating and other forms have also had their place. Many attempts to get a more direct turning action on the shaft have been tried in the rotatory form of engine but until quite recently these have been found too wasteful in steam to admit of commercial success. The exception to this condition is an English invention, the Parson's steam turbine, to which reference will hereafter be made.

The steam generator has, like the engine, had various forms both in respect of strength and power of steam raising. In the earlier days of the steam engine, steam pressures only a few pounds above the atmosphere were used. Later Watt's great invention, the separate condenser, was utilized, and as a consequence a considerable addition to the effort on the piston was obtained, through the resulting vacuum. In some cases the boilers of the early steamers were made of copper, but this soon gave place to iron, which, in its turn, retired in favor of steel. As the efficiency of a boiler depends largely on the extent of its heating surface, whereby the heat of the gases from the surface is taken up and imparted to the water, it was soon found that flues and tubes were of great advantage; and boilers in which all hot gas from the furnace is led through a series of tubes surrounded by the water within the shell of the boiler to the chimney, or smoke-stack, are now usually employed in large steam vessels. Numerous attempts have been made to get a satisfactory working boiler in which the water is within the tubes and the hot gases play around them, and more than one type of this class of boiler is now used at sea.

To favor economy of working, steam pressures have been raised, and the compound, triple and quadruple types of engine were devised to give the necessary expansion. Even to the mind of the marine engineer, it must, upon reflection, seem a wonderful thing that the great engines of ocean steamers, although burning several hundred tons of coal per day, yet only require about 1½ lbs. of coal to be burned every hour to give a horse-power in the engines.

THE STEAM TURBINE.

The question of economy brings us to the most recent type of steam engine—the steam-turbine. As has already been mentioned, engines of the rotatory type have been all great wasters of steam, and many attempts have been made to overcome this defect, as there was much in the simple, direct action of these machines to recommend them to engineers. The Parsons' steam turbine, at first applied to driving dynamos for the production of electric energy, and afterwards tried successfully in the small steamer Turbinia, has given good results economically. To test its suitability for river steamers a boat was built on the Clyde, and favorable trials having been made, the people of Scotland have now an opportunity of traveling on this latest type of steam-driven vessel. She has been named the King Edward, and at her trials on a measured mile, about a year ago, she attained a speed of nearly 20½ knots per hour, which is equal to 23½ statute miles. She is a "screw" steamer, capable of carrying 2,000 passengers. She was built at Dumbarton (Scotland) by the firm of Denny, and as side-wheelers have usually been adopted for the British coast-passenger traffic, she may be regarded as a new departure in the Old World, where changes come slowly. Her propellers revolve at from 700 to 1,000 revolutions per minute. Somewhat remarkable results have also been obtained with three other vessels fitted with the Parsons' machinery—the Turbinia, already referred to, a small ship of 100 ft. in length, which attained a speed of 34½ knots; the British torpedo-boat destroyer, Viper, 210 ft. in length, which attained the extraordinary speed of 37 knots, or nearly 43 statute miles per hour; and the Cobra, also one of the torpedo-boat destroyer class of naval vessels. The last-named literally "went to pieces" in September of last year, but the report upon the accident, which involved the loss of most of her crew, does not discredit the principle of the turbine.

As is well known, one of the most efficient forms of water-wheel is that of the turbine in which a number of curved blades fitted round an axle are made to revolve rapidly by the action of a jet or swift current of water. In the Parson's steam turbine, the water is replaced by steam, which is allowed at a high pressure to flow into a circular casing, into which there is a drum containing a great number of vanes of different sizes, and set at various angles. This drum in rotating turns the shaft into which it is fixed, and so gives motion to the machinery—or to the propeller of a steamship. In the older forms of rotatory engines, the steam, after pressing forward the moving parts, was finally ejected into the atmosphere, with a large part of its energy not utilized. The time has not yet been reached when any forecast of the future of the turbine engine can be made, as experiments with large ships are still in their infancy.

BRIEF TABLE OF REDUCTION OF TIME OF VOYAGE BETWEEN GREAT BRITAIN AND THE UNITED STATES.

Year.	Time.	Name of Ship	Tons.
1862.	Under 9 days (from Queenstown)	Scotia	3,871
1869.	Under 8 days (from Queenstown)	City of Brussels	3,080
1882.	Under 7 days (from Queenstown)	Alaska	6,400
1889.	Under 6 days (from Queenstown)	City of Paris	10,669
1894.	Under 6 days (from Queenstown)	Lucania	12,950
1897.	Under 6 days (from Southampton)	Kaiser Wilhelm	14,349
1900.	Under 6 days (from Southampton)	Deutschland	16,502

PROGRESS IN SIZE OF STEAMERS.

		Tons.
1838	Great Western first to exceed 200 ft. in length.	1,340
1845	Great Britain first to exceed 300 ft. in length	2,084
1871	Oceanic (I) first to exceed 400 ft. in length	3,807
1881	Servia first to exceed 500 ft. in length	7,393
1893	Campania first to exceed 600 ft. in length	12,952
1899	Oceanic (II) first to exceed 700 ft. in length	17,247
1858	Great Eastern 680 ft. long, 18,918 tons.	
1901	Celtic 700 ft. long, 20,904 tons.	

OUTFIT FOR WRECKING AND TOWING.

Vessel masters trading to Lake Michigan may find it to their advantage to consult the announcement of the Lake Shore Stone Co. (see page 45) regarding their outfit for wrecking and towing.

The tug Kate Williams was entirely rebuilt at Milwaukee the past winter, over $10,000 being expended on the hull alone. The boilers and engines were thoroughly overhauled, making her now one of the most powerful tugs on the lakes. The scows Swift and Klondyke are each 135 ft. long and 30 ft. beam, and were recently entirely overhauled. They are each equipped with very strong derricks and large hoisting engines, capable of handling loads of over 5 tons on single whip. Each scow is equipped with 200 boxes of 3 yds. capacity, for rapid handling of cargo. The steamer Hennepin has been thoroughly rebuilt and is to-day one of the strongest boats on the lakes. She is equipped with automatic unloading apparatus.

This outfit is used by the Lake Shore Stone Co. for transporting stone from Stone Haven, 9 miles north of Port Washington, to points on Lake Michigan, the company having opened immense quarries and built a substantial stone pier extending 1,000 ft. into the lake. They have installed the largest stone crusher ever built in the world, and the stone is automatically stored in great stock piles and loaded into boats automatically by belt conveyors. The Kate Williams is used for towing the scows Swift and Klondyke, which transport rip-rap and crib stone, the latter in large boxes so the stone may be handled by derricks on the scows and delivered directly into the crib work without handling by hand. The capacity of the company's plant is nearly 4,000 tons of stone per day.

The plant is the most modern stone plant in existence, and with its transportation facilities willl be able to supply stone for harbor work with promptness and dispatch as well as to respond to any calls which owners or masters may make upon the company when the services of a powerful tug and lighters are desired.

The main offices of the company are in the Herman Building, Milwaukee, telephone Main 1319. The quarry office (long distance) is "Lake Church."

CHICAGO PNEUMATIC TOOL CO.

The material advance of the United States has been due to the invention and application of labor-saving machinery. Everywhere is this tendency to minimize manual labor noticeable. It finds an almost perfect exemplification in the use of compressed air as a motive power and its application to various pneumatic appliances such as drills, hammers, riveters and hoists which now perform with slight effort the work that was hitherto done by hand at infinite cost. One has but to visit the ship yards, railway shops and foundries of the country to observe the new methods of reaming, caulking, tapping, chipping, drilling, riveting and hoisting and to appreciate the great advantage which it has over the laborious hand methods formerly in practice. Both inventor and manufacturer share alike in credit for this emancipation of labor, and foremost among the latter must be placed the Chicago Pneumatic Tool Co., which now practically controls the pneumatic business of the entire world. The career of this company has been attended with astonishing results. Beginning in a small way it has in an incredibly short space of time taken the leading place, both in the United States and in Europe, in the manufacture of pneumatic tools. All the company's factories are working day and night to fill immense orders which are being received by every mail.